PREVALENCE OF CHILD MALNUTRITION AND FACTORS ASSOCIATED WITH IT: A CASE STUDY OF MOROGORO URBAN

BY

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ABSTRACT

The problem of malnutrition is chronic all over the world, and protein-energy malnutrition (PEM) is the commonest form of malnutrition especially in developing countries. This study examined the prevalence of child malnutrition and factors associated with it in Morogoro Urban, Tanzania.

Data were collected through face-to-face interviews using a pre-tested questionnaire to a sample of 198 mother-child pairs drawn randomly from those attending maternal and child health (MCH) clinics in Morogoro Urban. Questionnaires were also administered to MCH coordinators and nurses and to NURU (Nutrition Rehabilitation Unit) workers/nurses. Secondary data were collected from other relevant sources.

Statistics such as frequencies, means, median, standard deviations and percentages were calculated. Chi-squares, multiple regression, correlation coefficient and Path Coefficient analysis were performed.

Results showed that malnutrition rate in Morogoro Urban is still high. More than 30 percent of sampled children were malnourished. The most prevalent forms of malnutrition were: underweight followed by Kwashiorkor and Marasmus. The factors associated with malnourished are analysed, discussed and reported.

Recommendations given to alleviate the malnutrition

problem in Morogoro Urban included among others: the need for a multidisciplinary action programme on nutrition education at household level; mothers should be encouraged to engage in income generating projects; the need for the Government to subsidize the costs in hiring tractors for cultivation and mothers should be encouraged to wean and feed their children as recommended.

The Government and other relevant institutions should ensure that women have access to appropriate technologies to reduce their heavy workload.

DECLARATION

I, CHRISTINA ISHENGOMA, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work and has never been submitted for a degree award in any other university.

Signature .....

Date 12/11/1992.....

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ABREVIATIONS

FAO	-	Food and Agriculture Organization
MCH	-	Maternal and Child Health
NURU	-	Nutrition Rehabilitation Unit
PEM	-	Protein Energy Malnutrition
IMR	-	Infant Mortality Rate
RDD	-	Regional Development Director
TFNC	-	Tanzania Food and Nutrition Centre

CHAPTER I

INTRODUCTION

1.1 Background Information

Malnutrition is broadly defined as a situation where inadequate intake and/or utilization of nutrients to fulfil requirements in a given physiological and social context (Aguillon et al 1982). The physiological context is important because diseases, for example, diarrhoea, severely reduces absorption and utilization of nutrients. The social context is important because human beings can adapt to low nutrient intake by reducing physical activity. If the social context requires hard work, people either have to reduce their performance or they become malnourished if their energy intake is too low and body reserves are insufficient (FAO 1983; Aguillon et al 1982).

It has been suggested that malnutrition is the most important public health problem in developing countries as well as the developed countries (Passmore and Eastwood 1986; Maletnlema 1977). The extent of malnutrition is often underestimated, as deaths due to malnutrition may appear to be low in government health statistics. It is very likely that malnutrition is widespread (FAO 1982a).

Malnutrition is always associated with infections (TFNC 1987). Malnutrition combined with infections may be the most important factors leading to abnormal growth and

development (Missano 1987). In childhood it affects later physical and mental development straining the national economy both in terms of the cost of treatment and the lowered productivity in adulthood (FAO 1982c). Malnutrition affects the social, economic and physical well being of the individuals and therefore the community (TFNC 1980; Jonsson 1977; Keregero and Keregero 1987).

Malnutrition problem is not a medical one, although the manifestations of it are medically identified. Malnutrition problem has for too long a time been attacked by too narrow and medical oriented measures (Latham 1984). Malnutrition is a problem concerning not only physicians, nutritionists, food technologists, biologists and biochemists; but it also concerns politicians, sociologists, teachers and welfare workers (Nsherenguzi 1986). It is not a transient problem that can automatically be solved by the process of development. If nutrition problems are to be alleviated, more integration at various levels in both short and long term planning and implementation is required. Also a food and nutrition policy that would provide direction on how to alleviate malnutrition is imperative (Shaba 1983; FAO 1982d).

The absolute number of either undernourished or malnourished people is increasing, despite the fact that per/capita food production is at present rising, both on a worldwide basis, and within the developing countries themselves. This fact is especially true among the

vulnerable groups of the population particularly children. Indeed, increased food production by itself will not solve the problems of hunger and malnutrition which face the majority of people in developing countries. Hunger and malnutrition are inextricably bound up with poverty and hence with economic and social development (Mtebe et al 1988; FAO 1982a; Mohmoud 1983).

A study conducted in Morogoro in 1984/85 revealed a widespread malnutrition and nutrition related disorders, despite the region's potential as one of the leading food producers in the country (UNICEF 1985b). This situation also applies to many regions in Tanzania. Malnutrition remains a pressing problem in Tanzania and combined efforts must be carried out to eradicate it (Lweno 1988). Many steps have been taken to improve the situation but the frequency of malnutrition does not seem to have changed much over the years (TFNC 1983).

1.2 Problem Statement

Malnutrition has been a big problem amongst children, especially the under fives. The situation is worse in its contribution to infant mortality (Maletnlema 1977). Shaba (1983) estimated between 400 and 849 million people in the world to be suffering from malnutrition leading to ill health. Tanzania is among those countries in the world with the highest infant and child mortality rates (Government of Tanzania and UNICEF 1985). More than 50 percent

of all deaths are of children under five years of age.

There a number of factors which can lead to malnutrition in urban areas, although many authors tend to emphasize poor economic situation (Kazema 1982). Several investigators, for example Kingamkono (1987); Jana (1982); Mgaza (1980) and others have studied the effect of income and economic status, feeding practices, nutrient intake and the bulkiness of weaning foods on child nutritional status. These investigators considered single factors in isolation. Few studies on the comparison between factors associated with malnourished and well-nourished children have been conducted. This study intended to examine the inter-relationship between the factors affecting malnourished and well-nourished children and their relative importance particularly in the case of Morogoro urban.

It is important to find out the factors which are associated with malnourished children and to determine whether they are similar to those factors associated with well-nourished children. Then make recommendations which may alleviate the problem. This study was conducted to determine the actual situation of malnutrition in Morogoro Urban and will help the nutritionists/planners, other agencies and policy makers to plan and take action on how to solve or minimize the malnutrition problem in Morogoro Urban.

1.3 Objectives of the study

The specific objectives of this study were as follows:

1. To identify the most prevalent forms of malnutrition in Morogoro Urban.
2. To determine the rate of under five children suffering from malnutrition in Morogoro Urban.
3. To identify the factors associated with malnourished and well-nourished children in Morogoro Urban.
4. To compare the factors associated with malnourished and well-nourished children in Morogoro Urban.
5. Based on the findings to recommend ways of alleviating the malnutrition problem in Morogoro Urban.

1.4 Hypotheses

The hypotheses tested were as follows:

1. There is a significant difference between factors affecting malnourished and well-nourished children.
2. (a) Malnutrition is significantly independent of level of income.
   (b) Malnutrition is significantly independent of mother's level of education.

3. (a) Malnutrition is significantly independent of methods of feeding, that is breast-feeding or bottle-feeding.

(b) Malnutrition is significantly independent of type of weaning foods.

(c) Malnutrition is significantly independent of feeding frequency.

4. (a) Malnutrition is significantly independent of the workload of the mother.

(b) Malnutrition is significantly independent of the parity of the mother.

(c) Malnutrition is significantly independent of the age of the mother.

(d) Malnutrition is significantly independent of infections and diseases.

CHAPTER II

LITERATURE REVIEW

2.1 Protein Energy Malnutrition (PEM)

The types of nutritional problems which exist in Tanzania are not very different from those in other developing countries. This means that PEM is the most prevalent type of nutritional problem (Gershwin et al 1989). PEM is known to result from the situation where there is inadequate intake and/or utilization of energy and protein to fulfil the body requirements in a given physiological and social context (Magambo 1986). Inadequate energy intake can result in the use of the dietary protein for energy instead of being used for growth and maintenance (Passmore and Eastwood 1986; TFNC 1980; FAO 1982c; Seenappa 1987). Protein deficiency with adequate energy intake may occur if the staple food has low protein content such as cassava and bananas (Jonsson 1986; FAO 1982b).

PEM can be either in severe or silent moderate forms (Taylor 1980; FAO 1982a). Proportionately the severe forms contribute to about 5 - 9 percent of malnutrition in the children population while the moderate forms contribute about 40 - 60 percent in children below the age of five years (TFNC 1984; 1987; Jonsson 1986; Keregero and Keregero 1987; Kingamkono 1987). Therefore in Tanzania it

means that of the estimated 4.4 million children who are below 5 years of age, about 2.28 million have moderate PEM and 220,000 are severely malnourished (Government of Tanzania and UNICEF 1985; TFNC 1987). The functional definition of moderate PEM would be a person with more than 20 percent weight-for- height deficit (Mrisho 1987; Ljungqvist 1987). Severe PEM would be one with a deficit of more than 40 percent weight-for-age (Mrisho 1987; FAO/WHO 1981; FAO 1987).

PEM is most acute for children of 1 to 3 years of age who because of the nutrient demands of growth, need balanced diet, even more than adults (TFNC 1980; Jonsson 1986; Sarakikya et al 1987). From various TFNC reports the same trend can be observed in Tanzania (Kisanga and Bunga 1983; Kavishe et al 1984; Kingamkono et al 1986). The 1978 Population Census has shown that in Morogoro 140 per 1,000 born alive children die before the age of 5 years (UNICEF 1985b).

The extreme forms of PEM are Marasmus and Kwashiorkor. In Marasmus, there is extreme wasting of body; the child usually weighs less than 60 percent of the normal weight- for-age. In Kwashiorkor, there is less wasting and less of weight but oedema is manifested. The moderate form of PEM is far more widespread in Tanzania. Additional types of malnutrition associated with PEM are anaemia and vitamin A deficiency (Jonsson 1986). Underweight is not readily visible and it is the most

important type of PEM in childhood (Mrisho 1987; FAO 1982a). It affects up to 30 percent of all children between 1 to 3 years of age (Wood et al 1984). Underweight children can only be detected as a growth failure when weight-for-age or arm circumference is measured (Wood et al 1984).

The underweight children grow more slowly, prone to infections as they have weak body defence and do not develop antibodies easily (Sarakikya et al 1987). Also they develop severe forms of PEM easily during episodes of infections.

2.2 Classification of PEM

There are various ways of classifying PEM; the most common being:

Welcome Classification: Welcome Classification is commonly used in Tanzania (Kimati 1978; FAO 1982b). It is based on weight-for-age and presence or absence of oedema (FAO/WHO 1981).

Waterlow Classification: Waterlow classification is based on height-for-age and weight-for-height (FAO 1982a; Latham 1984). In this classification deficit in height-for-age is equivalent to stunting while deficit in weight-for-height is equivalent to wasting (Latham 1984).

Gomez Classification: Gomez classification is based on weight-for-age irrespective of oedema. In this classification there is:

Normal nutrition (more than 90 percent weight-for-age)

1st degree malnutrition (75 - 90 percent weight-for-age).

2nd degree malnutrition (60 - 75 percent weight-for-age).

3rd degree malnutrition (less than 60 percent weight-for-age).

The weight for age was defined by FAO (1982) to be:

$$\frac{\text{Percent weight of child}}{\text{Standard weight-for-age}} \times 100$$

2.3 Malnutrition and Its Economic Effect

Malnutrition affects the social, economic and physical well-being of the individuals and therefore, their communities. In adults malnutrition causes physical weakness and lack of stamina for sustained work. It reduces initiative and increases sluggishness. All these conditions often lead to decrease working capacity which leads to low production, poor living conditions and diseases in a cyclic relationship (Figure 1).

The vicious cycle of malnutrition in turn, reduces social and economic development in a community. Economic effects of malnutrition are not easily quantifiable but can also be viewed in qualitative terms. In this context, economic effects of malnutrition may be looked at in terms of decreased productivity; incapacitation; increased mortality; and increased disease frequency.

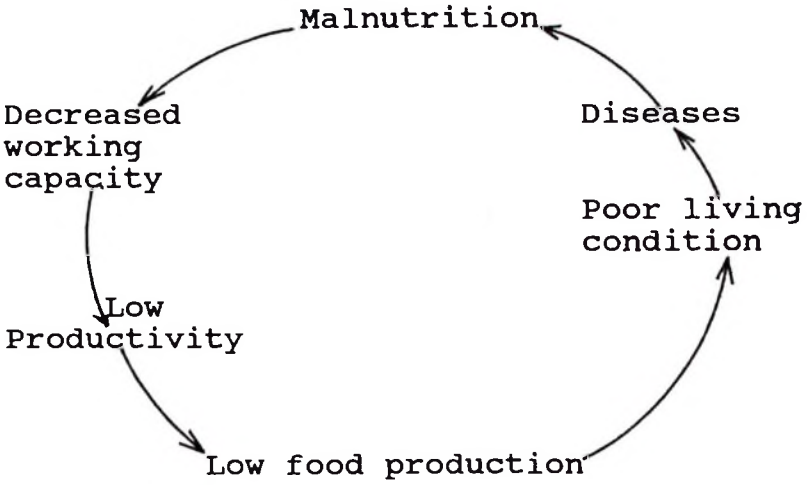

Figure 1: The Vicious Cycle of Malnutrition

Source: FAO (1982b)

2.3.1 Decreased Productivity: Man needs food to work.

In a situation of low energy intake man adapts himself by reducing his physical activity. For example, the physical output of someone eating 3,000 k/calories a day is quite different from the one eating 2,000 k/calories a day or below. Also someone who is anaemic tires easily hence decreased productivity (FAO 1982a).

Many studies have been conducted to show the relationship between workers' nutritional status and productivity. For example, Neuberger and Jukes (1982) found that lighter subjects perform less well than heavier ones. This implies that maximum working capacity as well as work output in actual life situations is found to be related to body weight. Energy expenditure studies in Tanzania for those community reputed to be hard working

had a mean intake of 2,500 k/calories whereas the less hard working took on average 2,000 k/calories per day (Maletnlema 1977). This is because low food intake affects productivity as man adapts himself by reducing his physical activities (FAO 1982c).

2.3.2 Incapacitation: The incapacitation resulting from malnutrition is of two categories: mental and physical, with regard to mental incapacitation, a number of scientists have observed effects of child malnutrition on brain development. Malnutrition during infancy may be associated with intellectual impairment. However, it is difficult to relate intellectual impairment to a single factor bearing in mind the totally deprived environment characteristic of malnourished children. Those children who get severely malnourished during childhood may grow up as mentally subnormal individuals with limited opportunities to develop or become productive (Keregero and Keregero 1987).

Also for physical incapacitation, one can take the case of vitamin A deficiency. Children who suffer from severe vitamin A deficiency may end up blind. Such people have limited opportunities in most developing countries. They together with their children, may have to live on low income thus perpetuating poverty, diseases and malnutrition (Perrise and Polaceni 1980; Government of Tanzania and

UNICEF 1985; Jonsson 1986; Magambo 1986; Passmore and Eastwood 1986).

2.3.3 Increased Disease Frequency: Only a fraction of those children who are malnourished die. Those who are left behind are easily infected and fall victims to diseases easier than healthy ones. There are many costs involved when a child gets sick. The short-term effect is that someone has to take time off the farm or office to look after the child at home or to take the child to the hospital or traditional healer. Many man-hours are lost thus disrupting production. There are also costs involved if the child is hospitalized or has to be seen and treated by a traditional healer. If the child is of school age, there is the absenteeism from school which may have a long-term economic effect (Keregero and Keregero 1987).

2.3.4 Increased Mortality: In the case of Tanzania, malnutrition is direct or underlying cause to about half of all children who die before five years of age. The death of a child means the loss of all investment made in pregnancy, rearing, feeding and socializing the child. As a long-term effect, the death of a child means that the child's expected life productivity will never materialize. This has a direct negative impact on the national economy more so for a country like Tanzania which is basically agricultural and dependent on human labour (Jonsson 1977).

Jonsson (1977) estimated the costs to be a national loss of T.sh. 15 - 20 million annually in Tanzania. This is a leakage out of the economy never accounted for. The economic effects of malnutrition are summarized in Table 1.

2.4 Factors Associated with Malnutrition

The problem of malnutrition is complex and has multifactorial causes in the sense that there are various ways in which it can occur. For example, Francois et al (1982) found that great risk of malnutrition exists in those households with large families and low income. Lambert (1980) point out the causes of malnutrition to be unequal food distribution within households; the sale of subsistence food stuffs to urban markets for cash and diversion of income to non-food items. FAO (1982c) documented that rapid urban expansion with the pressure it puts on housing, water, sewage facilities, transportation and distribution of basic commodities creates health and malnutrition problems especially for those people living in urban areas.

Maletnlema (1977) and UNICEF (1985a) pointed out that the most common cause of child malnutrition in Tanzania is that they do not eat often enough each day. Other causes of PEM are abrupt weaning and lack of hygiene (Passmore and Eastwood 1986; King 1985). Okeahialam (1975) indicated that the factors associated with malnutrition

were interrelated which may aptly be described as the family factors of protein calorie malnutrition (PCM). Source of these factors involve the child only, others are maternal, paternal or result from remote or direct influences of extended family.

Table 1. Economic Effects of Malnutrition

	Direct Effect	Indirect Effect
Short-term effect	Parent's cost of stay at home, transport to health centre, medicine, burial.	Loss of investment in a child who dies.
	Cost of health care (at home or hospital).	Use of scarce resources may displace someone in the health care system who would need it most.
	Absenteeism from work. Decreased worker's productivity.	Grief and unhappiness connected to disease and death of someone.
Long-term effect	Loss of life-long productivity of a child who dies.	High child mortality hinders sound family planning.
	Absenteeism from school affects productivity in the future. Lower productivity as a result of mental retardation.	Contributes to the continuous spread of communicable diseases. Educational results lowered by learning capacity.
affected		

Source: Lishe (1977).

Whatever the type of malnutrition, it can be the outcome of either an insufficient food intake or of poor food utilization by the body (or both simultaneously). An insufficient food intake is related to various factors such as insufficient food production, low income, difficult access to the market, workload of the women who have not enough time for preparing meals; and poor nutrition knowledge of men and women. Poor food utilization is due mainly to a poor sanitary environment and to infectious diseases (FAO 1982b).

Food consumption surveys in Senegal showed that socio-economic factors associated with malnutrition were the prices of both food and non-food items; income of the family; religion; the origin and quality of food supplements (Report of the Working Group Paris 1980). Kazema (1982) pointed out that there are a number of factors which can lead to malnutrition in urban areas, although many people tend to emphasize poor economic situation. Wray and Aquirre (1963), in their studies in Columbia, identified the following factors which are associated with malnutrition: epidemiological; cultural; maternal; economic; demographic and time interval between the births of children. All these were found to have direct relationship with malnutrition. No single cause is responsible for malnutrition in any particular child but these factors are interacting.

FAO (1982b) pointed out that the commonest causes of

PEM are: early weaning; late introduction to and quality of complementary foods; abrupt weaning; poor meal pattern; and infections. A study on prevalence of child malnutrition and factors associated with it in Morogoro Municipality showed that high prices of both food and non-food items; poor weaning and child feeding practices, diseases and infection; and level of nutrition education of mothers were associated with child malnutrition (Missappe 1988). Some of the factors associated with malnutrition are summarised in Figure 2.

2.4.1 Relationship between Level of Income, Level of Education, Beliefs and Taboos and Child Malnutrition

2.4.1.1 Level of Income: A major factor influencing our diet is income. When the income is low, there will be inadequate money to purchase food. The most affected group is children which results in malnutrition (FAO 1980; TFNC 1980; King 1985). A study done among malnourished children in Makadara, Zanzibar, showed that the rate of malnutrition is related to the income level of the household. Higher percentages of malnourished children were found in low income groups followed by average and least with above average income groups (Mohmoud 1983).

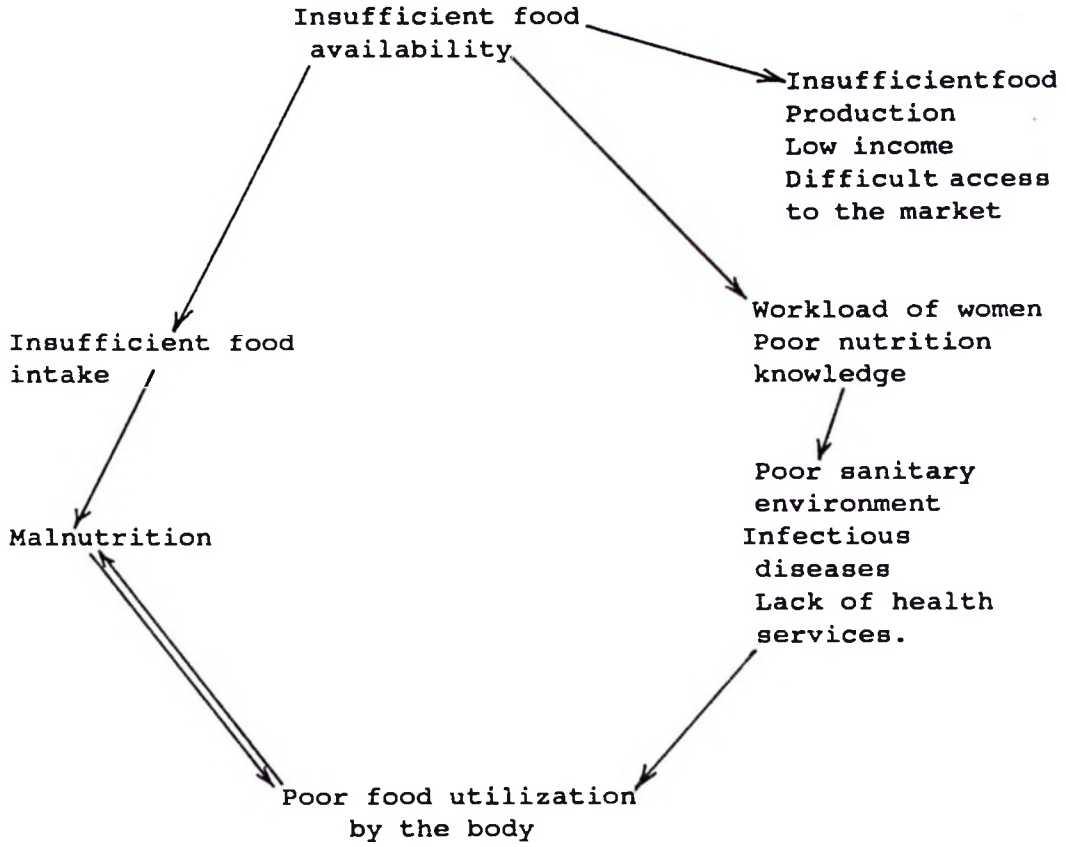

Figure 2: Causes of Malnutrition

Source: FAO (1985).

Mgaza and Bantje (1980), in their case studies, in Dar-es-Salaam found that those families with low income have high incidence of malnutrition. The condition is made worse when the same families with low income are extended. The relatives and friends staying with the family put heavy strains on the family budget, as a result it becomes inadequate to feed everyone as required. In the same case studies, Mgaza and Bantje (1980) found that there were families who used only Tsh. 30/= to feed one child in one whole month, or a child was breastfed only, since the mother could not afford to buy supplementary foods.

Kazema (1982) conducted a study on the relationship of the "risk factors" to malnutrition in urban areas in Ujiji, Kigoma. The findings showed that the types of people who migrate into these areas are young adults both males and females. Most of these young adults do not have work or means of earning. The young adult females may be from a broken family, divorced or widowed. These are the females who tend to get unwanted pregnancies in urban set up and they are the ones who have limited resources to care for themselves and their expected children.

Francois et al (1982) worked on the effect of income on nutritional status and found that both the size of the household and household income have a direct impact of the probability of inadequate consumption. However there is no specific household size or household income at which people will be underfed. Rather the probability of nutritional risk increases as household income decreases. The author concluded that great risk of malnutrition exists in those households with large families and low income.

Insufficient intake of calories and protein are caused primarily by the inability of low income households or individuals to acquire sufficient food at a given point in time and not by an absolute scarcity of food in the market (Andersen et al 1972). The author added that the ability to acquire sufficient food is determined by a number of factors. The most important ones include the

amount of real income controlled by the household and food prices. Cépéde (1984) pointed out that a combination of migration, income and high costs of living in urban areas provide limitations in the choice of food items for the majority, thus resulting in poorly balanced diets. Mgaza (1980) pointed out that those people with low level of income are almost the ones with low level of formal education, poor facilities and also low food availability.

Usually the diets of low income groups are dominated by roots and tubers, cereals and pulses. With increase in income the consumption of roots and tubers decreases. The income elasticity of demand for food, is the percentage change in expenditure of food caused by a one percent change in income. For income levels in Tanzania as a whole this elasticity is estimated to be 0.32 for cereals, 0.6 for nuts and pulses and 1.0 for meat (TFNC 1980). A desegregation by income group on food consumption has been attempted in the partial analysis for urban centres of Dar es Salaam, Tanga and Kilimanjaro (TFNC 1980; FAO 1980).

As income rises, consumers buy more food, but a smaller proportion of that income is spent on food. Incomes are more unequally distributed in the developing countries. For sometime, the developing countries will continue to be heavily dependent upon grains for their food. The developed countries will continue to consume less grain directly, and they will convert more grain to meat, milk and eggs. The demand for food depends

primarily upon population and income growth, the level and distribution of income and the proportion of income spent for food (FAO 1980).

A study by Lyimo (1989) on the relationship between mothers' involvement in income generating activities and child nutritional status in Morogoro Municipality showed that there was a higher percentage of undernourished children among mothers who were not involved in income generating activities, while the majority of the well-nourished children were found among mothers who were involved in income generating activities. The relationship between child nutritional status and hours engaged in income generating activities was not statistically significant at $P<0.05$.

2.4.1.2 Mother's Level of Education: Ignorance and malnutrition are complementary and any successful effect to reduce one is likely to diminish the other. Education can be an important aspect in solving child nutritional problems, since education seems to affect most of the factors contained in the malnutrition complex (Feyisetan 1986). For centuries feminists have pointed out the advantages of educating women (Basse 1984; UNICEF 1984 and Feyisetan 1986). However, many generations passed before even primary education for girls was universally available in many countries (Owie 1980). The societies did not know that women who acquire even a minimal basic education were

generally more aware than their sisters, of the needs to utilize available resources for improvement of health, particularly nutritional status of themselves and of their families (UNICEF 1984; Munyakho 1988).

UNICEF (1984) reported that education helps women to have more knowledge about house-keeping and household management. Mrisho (1985) and FAO (1987) reported that mothers with high education can have many and better skills of preparing meals for the family. FAO (1982a); Neuvians (1987) and Munyakho (1988) observed that mothers with higher education tend to practice better child spacing which allows them to improve their health and care for their children.

WHO (1982); Seenappa (1987) and TFNC (1988) observed that increased prevalence of malnutrition is to a large extent associated with low education among mothers who know little about the food and diet necessary to meet every body's needs for nutrients. Low education may lead to a low nutritional status among children due to poor purchasing power, poor environmental sanitation, poor personal hygiene, as well as restrictive feeding practices during child's illness or convalescence (FAO 1982a) which tend to intensify the effect of infection.

Gadiel (1986); Missappe (1988) and Bonaventure (1989) observed that the higher percentage of malnutrition cases in Morogoro urban were found to be associated with less years of formal education of the mothers. According to

Missappe (1988), 76 percent of the mothers who had no formal education had undernourished children compared to zero percent for mothers with University education. The trend was 74 percent for mothers who attended adult education only, 61 percent for mothers who attended primary school, and 28 percent for mothers who attended secondary school (Missappe 1988).

UNICEF's (1984) on the "State of the World's Children" showed that over 24 separate studies in 15 different nations have observed that the level of the mother's education even within the same economic class is a key determinant for her children's nutritional status. In Pakistan and Indonesia, the infant mortality rate among children whose mothers have had primary education level, was found to be 50 percent lower than those of mothers who were illiterate (Ryan 1984). A study of six villages in India found that infants of educated mothers had higher intake of vitamin A and calcium than did infants of uneducated mothers (FAO 1987).

In many instances people do not make better nutritional use of existing food resources because they are ignorant of different ways to prepare food or better means of storage or even new nutritious yet expensive foods (Austin 1981; Zeitlin 1981). A study conducted by Mohmoud (1983) in Zanzibar showed that as far as parents' educational status is concerned, higher percentages of malnourished children were found to be of parents with

less than primary education. A study of the Child Survival and Development (CSD) programme in Morogoro Region showed that malnourished children were found to be of mothers who are illiterate or primary school educated (Mtebe et al 1988).

Andersen et al (1972) pointed out that lack of proper education on dietary practices, taboos and food restriction and a set of other socio-cultural aspects have been blamed for precipitating poor nutritional status. Ignorance is the ally of hunger. Together with poverty, which it often accompanies, it is basically responsible for virtually every case of malnutrition; and in countries where food supplies are inadequate, existing resources are generally badly utilized. Many causes of malnutrition could be prevented if mothers know how to make the best use of what food they have (Nsherenguzi 1986).

The relationship between education and child survival and development is well documented from many countries in the world. In rural Tanzania, the infant mortality rate was found to be 40 percent lower for children whose mothers had some primary education than those who had no primary education (Jonsson 1986). Bonaventure (1989) pointed that there was a relationship between maternal education and child nutrition. Poor nutritional status of children (in terms of weight-for-age), low feeding frequency, poor weaning foods, low mother's income, and long duration of breast feeding were more common among low

educated mothers.

Several researchers report that females spend less time in education than males (Bério 1984; Brandtzaeg 1982; Palmer 1985). This pattern holds true both for school age children and for adults. The main reason for keeping girls out of school does not seem to be the cost of education or conservatism, but rather the family's dependence on girl's labour at home and in the fields (Bério 1984). Daughters are, from an early age (often from 5 years) helping in the home, looking after small children and assisting women in the field. Usually girls are assigned responsibilities much earlier, and work longer hours than the boys (Safilios-Rostschild 1980; Bério 1984). Also the long working hours of the women will render little time to spend on educational activities. Palmer (1985) suggests that the poor attendance of women in literacy classes, compared to men, is due to their time constraints.

The lack of time is generally considered to be a serious constraint to any attempt to bring women into the mainstream of development. The universal pattern, as evidenced by time allocation studies is that women have less time than men to spend on their personal needs (Skjønsberg 1981; Hamilton et al 1985; Bério 1984).

Knowledge of food consumption levels among the vulnerable groups such as children, pregnant and lactating women is vital (Nsherenguzi 1986). He pointed out that

attainment of self-sufficiency in food would imply availability and provision of the amount of food mix and variety to everybody which will meet the acceptable nutritional requirements, in terms of energy, protein and vitamin contents or balanced diet. Often lack of proper education and a set of other socio-cultural aspects have been blamed for precipitating poor nutritional status (Andersen et al 1972; Piwoz and Viteri 1985; Cheny 1981).

2.4.1.3 Beliefs and Taboos: Closely related to the knowledge problem is the holding of certain beliefs and taboos which leads to nutritionally negative effects. For example, in some parts of Tanzania beliefs and taboos include restricting consumption of certain foods. Such as eggs or fish by young children or women (FAO 1982b). Results of food consumption surveys in five villages taken from five regions of Tanzania, showed that some of the protein deficiency is due to food habits based on the principle that "food is made by women for men and often the better share in quantity and quality is given to men" (Maletnlema 1977).

Another example of beliefs and taboos related to foods is the limited consumption of legumes. Different kinds of legumes are important source of protein in many developing countries; but weaning infants are not fed peas and beans for fear that these foods will cause flatulence and illness (Austin 1981). The other example is the

consumption of fruits and vegetables in Indonesia. Fruits and vegetables are rich in carotene, and are commonly available even among low income families. Young children, especially boys, however, are seldom fed vegetables, since they are not regarded as suitable food for young men (Andersen et al 1972).

Traditionally male adults have priority for certain kinds of foods within the family and taboos may limit the variety of foods available to different sex and age groups (FAO 1982c). Mhando (1985) reported that in most families in Morogoro urban male adults are served first with meals while females and young children are served last. These findings agree with the findings of Basse (1984). However, in Sri Lanka, children are served first (Wandel and Ottesen 1988). In addition to traditional eating habits, mothers' education and availability of household resources such as fuel and water also determine the type of foods the child gets (Gadiel 1985). According to UNICEF (1985b) these beliefs are influenced by community and culture, for instance, some mothers begin weaning very early than others because they believe that breast milk is not enough to fill the child's stomach (Mudambi 1985).

Food taboos specifically directed towards women, especially pregnant and lactating women are common throughout the world. In reviewing this phenomenon TFNC (1980) noted that restrictions are commonly put on protein foods particularly needed by women in pregnancy and

lactation. As pointed out by Ware (1981), few traditional cultures seem to recognize the increased nutritional needs of women during pregnancy and lactation. There are, however, important exceptions to this general picture for example, in Sri Lanka women are pampered and given special nutritious foods both during pregnancy and lactation (Ottesen et al 1989).

2.4.2 Relationship between Feeding Frequency, Feeding Methods, the Type of Weaning Food and Child Malnutrition.

2.4.2.1 Feeding Frequency: In Tanzania children below five years, are usually fed only two to three times a day. Only very rarely is any special food prepared for young children. The low number of meals per day and the low energy density of foods are the main causes of inadequate dietary intake and so malnutrition (Jonsson 1986). A study conducted in Morogoro region found that most children were fed only once or twice per day with plain maize flour porridge (UNICEF 1985b). The recommended feeding frequency is 4 - 6 times a day (UNICEF 1985b). Cereal based gruel or porridge has a low energy density which requires higher feeding frequencies (Jonsson 1986).

Data from food intake studies in young children in Tanzania were reviewed by UNICEF (1984). The analysis showed that feeding frequency is by far the most decisive

factor in determining energy adequacy of the diets. In Tanzania low feeding frequency seems to be the most important factor in determining child feeding adequacy in terms of energy intake. The main dietary reason behind high levels of PEM in Tanzania is inadequate intake of "total food" energy (Lukmanji 1987).

The low feeding frequency is primarily a result of the heavy workload of the mothers that leaves them little time to prepare food, collect firewood and inadequate facilities for food preparation in the households also contributes to this problem (TFNC 1987). A field study of women's work and child feeding patterns in Tanzania supports this line of thinking (Mascarenhas 1983). Mascarenhas (1983) found that in about half of the households studied, the pre-school children got only one or two meals a day. Lack of mother's time was found to be the main reason for such a low frequency of child feeding. In a follow-up study, Mascarenhas (1984) found that nutrition seemed to be worse in the households where women were working as casual labourers. Lack of food in these households during critical pre-harvest seasons forced women to do casual work during peak agricultural periods. Thus, the socio-economic condition was more likely to be both the cause of mother's working as well as of their children's nutritional condition.

A heavy workload for women may also lead to a poorer diet for the children and other members of the family.

The diet may be poor because there will be less time for preparation and cooking (Ottesen 1989). Meal frequencies have also been reported to be reduced. Bleaberg et al (1980) found in Upper Volta and Burkina Faso that lunch was skipped and feeding frequencies for young children reduced because women were working in the fields at noon. Palmer (1985) pointed out that the nutritional advice about cooking and diet offered by extension workers is not always taken, partly because women lack time for implementing such advice. Mother's time constraints affects the nutritional status of the children (Bério 1984; Hamilton et al 1984).

Yambi and Bantje (1982) reported that undernutrition is the result of too low consumption of food which commonly occurs among pregnant and lactating mothers and children underfive years of age. Jonsson (1986) observed that in many developing countries like Tanzania women are the main producers of the family food and the income earners. Therefore, they work outside the home most of the day time and therefore have little time to properly prepare dishes for their children and this results to low feeding frequency.

Some suitable and nutritious foods for infants such as legumes may not be used frequently as needed in areas where fuel (firewood) is scarce or expensive. As a result mothers opt for diets which consumes less time in cooking but which might be less nutritious (UNICEF 1984). It has

been noted that unavailability of household resources such as water, proper cooking and sanitary facilities make it more difficult for mothers to guarantee children extra preparation and uncontaminated foods (Aguillon et at 1982).

2.4.2.2 Types of Weaning Foods: Weaning foods which are commonly used in Tanzania, are starch-based in the form of very thin gruel. These are bulky and very low in energy density. Children have small stomach capacity and the volume of gruel they can take in a day is not enough to satisfy their nutrient need. This can be regarded as a major contributing factor to malnutrition in young children (Hellstrom et al 1981; Latham 1984; Nyang'ali 1986; Jonsson 1986).

Cereal-based weaning foods supplemented with legumes is a practical way of improving the protein quality of cereal granules and is a practice that is highly recommended and widely practised in Tanzania. Fermented gruels can, to some extent, be used to improve the nutrition of children. However traditional fermentation techniques do not appear to cause sufficient starch hydrolysis to influence significantly the dietary bulk of the gruel. Modifications that favour the growth of amylolytic micro-organisms and lactic acid producing bacteria would have to be developed to enable the production of gruel with higher nutrient densities

(Keregero and Kurwijila 1987). Recently the use of germinated cereal flour or "power flour" (P.F.) has been considered for the reduction of dietary bulk in weaning foods (Seenappa 1987).

There is no exact fixed time for a baby to start taking other foods. All babies are different. Many mothers have enough milk for their babies for six months or more. Some have enough for 9 - 10 months after delivery (Yohani 1981). The average time that a baby needs to start other foods is between 4 - 6 months. Breast milk energy/ protein ratio is only adequate for the first 4 - 6 months of life. Therefore a supplementary food must be introduced in order to achieve normal growth and development for a child (Hautvast 1981; Yohani 1981; Lyamuya 1983).

The giving of supplements is referred to as weaning. A large proportion of the world's children and nutrition disorders are found to be common at the weaning period (Latham 1984). This was found to be associated with unawareness of the nutritional needs of the weaning child, together with the ability of the average family to provide the necessary foods. Also several customs and norms associated with weaning are likely to give rise to nutritional deficiencies. The weaning food should be changed slowly depending on age of child from liquid to semi-liquid to solid (Latham 1984). The food must be adequate in amount and balanced in terms of variety of

nutrients in the food as well.

In West Africa women breast-fed for longer periods. Weaning is carried out between 4 - 24 months of life using bulky strongly peppered and spiced carbohydrates. The most common weaning foods are maize flour porridge, bread, boiled rice and cassava meal (Maletnlema 1983). Only a few mothers give beans to their children. Sweet foods like sugar, is considered harmful so are meat and eggs (Maletnlema 1983).

In Central Africa some communities do not start weaning until the baby is 8 - 9 months old. Weaning foods include millet porridge, scrapped bananas, sweet potatoes, cassava and sugar cane juice (Maletnlema 1983). Other communities start weaning at 4 - 6 months and the main foods used include maize porridge, mashed bananas, millet porridge and sweet potatoes. Eggs are not given to children and milk is rarely drunk except among the Masai and a few other pastoral communities. In poor urban areas of Tanzania the nutritional status has deteriorated with early introduction of infant formulae and weaning foods (Maletnlema 1983).

Studies conducted in some African countries indicate that the old practices of feeding infants are changing, but weaning foods remain the same except for the introduction of commercial weaning foods. A study of child feeding in urban Tanzania gave result very similar to other developing countries. Weaning foods were found

to be maize porridge, fruits and fruit juices, other cereals (rice, wheat, millet), roots (cassava, potatoes), meat and legumes, cow's milk and vegetables in that order of frequency in consumption (Mgaza 1980). In Tanzania many mothers do not add sugar, milk or oil to the more popular thin maize porridge. During the young child weaning period, the child needs proper feeding for adequate growth and development (Maletnlema 1983).

TFNC (1980) report on the food and nutrition situation in Tanzania pointed out that in areas where the staple is starchy foods like cassava (for example along the Coast and Kigoma) and banana (Kilimanjaro and Kagera) the incidence of protein-energy deficiency is much higher especially the Kwashiorkor type. On the other hand where the staple is mainly millet and maize (South, Central and North), there is a slightly less number of children affected by Kwashiorkor, but since these belts tend to be semi-arid and prone to food shortages the incidence of Marasmus is higher.

In a study of the type of weaning foods given to children in Dar es Salaam, women were asked about the first food or drink (except water and breast milk) they gave to their children. Half of the low-income women indicated that the first food given to their children was maize porridge, in the high income group only 24 percent indicated the use of maize porridge. With rising income, there is a tendency to replace maize porridge with milk

formula and glucose as weaning foods (TFNC 1980).

Weaning is supposed to be a gradual process, introducing other foods into the child's diet and meeting the child's requirements when breast-milk alone does not suffice. In Tanzania there are many cases of early introduction of weaning foods as well as prolonged breast-feeding without supplementary foods. In some cases complete weaning is done abruptly. For example, when the mother finds out that she is expecting another child (Mgaza 1980). A survey of weaning practices in Tanzania has shown that four months is the average age when weaning starts. Porridge mainly of maize flour is the main food used, however, other cereals are also used (TFNC 1980). The main problem is that only a small proportion of mothers enrich the porridge with milk, groundnut flour, or other legume flours. In some cases the foods used are so bulky (low calorie density) that undernutrition results especially where feeding frequencies are low (Mgaza 1980).

It was noted further that there was a tendency for the employed mothers to initiate weaning rather earlier than unemployed mothers. This was most clearly noticeable at the age of three months, when about 80 percent of the employed mothers have started giving weaning foods, against 48.6 percent and 66.7 percent of the unemployed mothers in low and high income groups respectively (Mgaza and Bantje 1980).

Yohani (1981) reported that the reasons for weaning

off the breast were: the mother was pregnant, child refused the breast, milk was not enough and child was old enough. Usually this happens when the child is two to three years of age. If the mother became pregnant earlier, the child was weaned immediately either through being sent away to a grandmother or through the application of unpleasant tasting substance (for example, pepper) to the nipples. Such abrupt weaning often culminated into ill-health to the child as well as emotional upset. Hautvast (1981) pointed that malnutrition usually sets in between the 4th and 21st month after birth. This is the start of the period of weaning, during which foods other than mother's milk supply an increasing proportion of the child's nutritional requirements.

2.4.2.3 Feeding Methods: Breast-feeding is widely practised in Tanzania (Yohani 1981; TFNC 1980; Koinange 1985). It forms the initial feeding to a newly born baby and maintained up to one to three years. However the energy/protein ratio is only adequate for the first four to six months of life and therefore a supplementary food must be introduced in order to achieve normal growth and development for a child (Mgaza et al 1980; Lorri 1985; Munyakho 1988). It provides the only perfect food for babies, and it lays the foundation of their healthy psychological development (Koinange 1985; King 1985;

UNICEF 1985a).

Breast-milk contains all the nutrients that a baby needs for the first four to six months of life. It contains antibodies (immunogloblins) to many infections. These help to protect a baby against infections, until he can have his own antibodies (King 1985; Koopman et al 1985; Mrisho 1985; Minchin 1985; TFNC 1988). Wyeth (1989) pointed out that the formula-fed babies lack this protective effect.

Breast-milk has the following advantages:

(a) For the mother it is economical and naturally it helps in bringing mother's shape from pre-pregnant state quicker and has a considerable contraceptive effect.

(b) For the child it gives passive immunity to combat common diseases and the right proportions of nutrients for growth and protects against development of allergic disorders.

(c) For both (mother and child) it gives emotional bond and satisfaction (Kavishe 1984).

Knutsson et al (1979) found that practically all infants in Tanzania especially in rural areas, are breast fed during the first six months of life. This enables the average Tanzanian infant to have satisfactory growth during the greater part of the first year of life. A preliminary survey in Dar es Salaam in 1979 showed that a relatively small proportion of infants were wholly breast-

fed. Mothers continued to breast-fed before and after working hours and used bottle feeds in between (Mgaza 1980). Breast-feeding practices enabled children to have good nutritional status particularly for the period before the children start to be weaned (Dakiyo 1988; Abel 1989).

According to Ngaleya (1986), 100 percent of women in Morogoro region breast-fed for the first six months, 91 percent from seven to twelve months and 63 percent from thirteen to twenty four months. In Tanzania the child is usually breast-fed on demand and no time-tables are used (TFNC 1980; Maletnlema 1983). Breast-feeding is done anywhere, in the open, along streets, in the market place. Also children may be carried on their mother's backs to the farm, river and other domestic work places to facilitate breast-feeding (TFNC 1980).

Kavishe (1984) pointed out that it is best to breast-fed children until eighteen to twenty four months although there is no harm in breast-feeding for longer periods. TFNC (1980) found that the pattern of breast-feeding in rural areas has remained essentially unchanged. About half of the children in the survey were breast-fed up to two years. Patterns in urban areas are, however different. Increasing urbanisation, changing life style, the increasing number of women employed outside the home and the exposure to advertising by infant formula companies through different channels are all resulting in changes in infant feeding methods (UNICEF 1985a;

Maletnlema 1983).

In the case of bottle-feeding, artificial feeds are often contaminated with bacteria, especially if the mother uses a feeding bottle and she does not boil it after every feed. This can be dangerous to the baby and results in malnutrition (Mrisho 1987). King (1985) documented the disadvantages of bottle-feeding to be high cost of both the food, equipment and fuel in addition to time needed for preparation; greater risk of microbial contamination of the food resulting into infection to the weaning children.

The high costs of bottle-feeding lead to over dilution and underfeeding of the infants. It is not surprising therefore that the decline of breast-feeding in the developing world is accompanied by high incidence of malnutrition of children (Ebrahim 1983).

In rural areas, most mothers continue breast feeding their children after the first year of life. In urban and periurban areas children are taken off the breast when they are young and are put on bottle-feeding, frequently overdiluted milk formula (Yohani 1981). In urban areas, as a result of modernization of infant feeding practices, there is a tendency of mothers to change from breast-feeding to bottle-feeding. Low standards of sanitation, high costs of purchasing tinned milk together with inadequate clean water in most of the families mean bottle- feeding cannot be conducted satisfactorily

resulting in frequent underfeeding and diarrhoeal diseases to babies. This results to Marasmus which is common in many periurban communities (Mgaza and Bantje 1980).

It has been estimated by UNICEF that every year one million infant deaths occur in the world due to causes related to bottle-feeding (Ebrahim 1983). The survivors of the initial episode of diarrhoeal often face a vicious cycle of malnutrition and recurrent diarrhoeal often resulting into death (Ebrahim 1983). Graca and Remelzwaal (1981) reported that in urban Maputo, Mozambique the use of artificial infant foods is increasing at the expense of breast-feeding. Also the number of children affected with diarrhoeal is increasing. In many cases bottle-feeding is introduced at the age of one to two months, because the mother resumes work.

A study conducted in Rwanda on feeding methods showed that the mothers in urban areas stop breast-feeding early and start bottle-feeding. However powdered milk is expensive so they dilute it to make the tin last, resulting into Kwashiorkor or Marasmus compounded by gastroenteritis if the hygienic rules for bottle sterilization are not properly applied (Munyashongore 1981).

Donvan et al (1987) suggested that mothers should feed their babies using a cup or spoon which are easier to keep clean than a bottle and teat. Mgaza and Bantje (1980) observed that a child needs just mother's milk

alone for the first three months provided that the mother has adequate breast-milk.

2.4.3 Relationship between Workload, Parity and Age of the Mother and Child Malnutrition

2.4.3.1 Mother's Workload: The life of women is very much a life of strenuous work (Lukmanji 1987; Lamming 1983). Women work harder than men and shoulder a larger share of responsibility for the family survival in Tanzania (Kahurananga 1980). Kavishe et al (1983) found that women's workload is often accompanied by low food intake, inadequate rest and high infection rates. Apart from being busy with agricultural production women also involve themselves in petty money raising activities. This unfortunately takes them many hours away from their children.

Women perform double roles of production and reproduction. On the production side, they form the greater part of the agricultural peasantry and on the reproduction side they are responsible for the upbringing of children from conception to adulthood and perform the greatest part of household chores. In the rural areas women work for many hours often under very hard conditions exacerbated by low technological development (Kahurananga 1980). Studies done in three districts in Morogoro Region have shown that women spend 14 - 16 hours (on the average) on domestic work, agriculture, child care and the rest of

the family. The outcome of this has an indirect effect on children by causing malnutrition due to inadequate time for child care and feeding by nursing mothers (Lukmanji 1987).

Kahurananga's (1980) study on women's activities and time consumption showed that women's workload often take up to 10 to 14 hours a day particularly during cultivation season. This level of activity remains the same even for pregnant women. Moreover she may be occupied with other income generating activities such as beer brewing out of sheer necessity for more cash. Several researchers have pointed out that the time spent by rural women on daily activities ranges from 14 - 16 hours (Carr and Sandhu 1987; Kahurananga 1980; Mascharenas 1984). Faced with their triple responsibilities of farm work, household chores and earning cash to supplement family incomes, tasks which often add up to a 16 hour-day, women in many of the developing countries particularly Africa, see the lack of time as a major constraint on their ability to improve family welfare (Carr and Sandhu 1987).

Fetching water being a sole responsibility of women makes the issue grim, as long distances to water sources have a negative effect on food production and child care, and also affect the health and nutritional status of women themselves. Women have been reported to carry as much as 19 to 25 kilogram weight of water on their heads or backs in a single journey. The proportion of daily energy

intake spent on water collection varies between 12 percent in humid areas to 27 percent or more in dry areas. This is extra demand in addition to other activities such as breast-feeding which requires 35 percent of daily energy intake (Lukmanji et al 1987).

Kavishe et al (1984) noted that an undernourished mother will tend to have low milk output leading to poor feeding of infants and early malnutrition. Chiduo (1981) pointed out that the African mother is heavily burdened with work, whether pregnant or not, her diet is sometimes poor and inadequate and as a result 5 - 20 percent of the newly born babies are already underweight at birth.

Numerous researchers have documented various aspects of peasant women's lives in different parts of the country. They have shown that peasant women shoulder an extremely heavy work-day which includes: fetching water and firewood, cooking, washing-up, child care, agricultural fieldwork, washing clothes and in some cases crafts and petty commodity production. In almost all instances, household chores and child care are women's responsibilities. Also, food production for family consumption is usually, if not solely women's responsibility. Cash crop production, on the other hand, has generally been the preserve of men (Mgaza 1980; Clark 1985).

From a study in Tanzania, Bantje (1980) indicated that low birth weights were related to women's seasonal

workload. Even when food was plentiful, but agricultural labour was demanding, low birth weight was common. However, these effects can be expected to vary in different circumstances, depending on the severity of the food shortage and the strain of the workload on the women. Perera (1986) pointed out that poor nutritional status and excessive workload of women may be related to different types of low birth weight: small-for-date or pre-term babies. The small-for-date babies have, by definition, suffered growth retardation before birth and are said to be malnourished. The low birth weight may have implications for children's nutritional status later on in life. Thus the mother's nutritional and working conditions may have varying impact on children's nutritional status.

Among the most frequently cited studies showing a negative effect of mother's working on child nutritional status is that by Popkin (1980). The mothers in the sample were engaged in different types of work including trading and farm work. It was found that even though mother's participation in these activities was associated with increased food purchases, children's nutritional status (weight/age, height/age and indicator of vitamin A status) seemed to be negatively affected (Popkin 1980).

Other studies have indicated that women's excessive work in food production is related to early weaning and early introduction of supplementary foods (Nardi 1984;

Tobisson 1980). Women's workload in other parts of the food chain may also affect child nutrition. Reports from Bangladesh (Chowdhury et al 1981) indicate that mother's seasonal work in processing of grains may reduce the time available for breast-feeding. It is reasonable to assume that such heavy work burden will affect women's health. A good example of women's hardship is described by Haswell (1981) from her field work in Gambia, where incidences of women collapsing from overwork and lack of food have been reported.

Women's work is a seasonal cycle in which child care and agricultural work compete for the mother's time and energy. The lack of time is generally considered to be a serious constraint to any attempt to bring women into the mainstream of development. Introduction of techniques and tools that can reduce the time and labour that women spend on certain tasks in the food chain, may have the potential of reducing the drudgery of women's work and give women more time to spend on other activities. However, studies show that this extra time is not commonly used for leisure or for increased participation in community affairs. Usually such time will be spent on family needs, such as cooking and child care or on production and income generating activities (Palmer 1981; 1985).

2.4.3.2 Parity and Age of the Mother: Throughout history, large families have been considered a blessing.

A change of economic pattern and life styles in Tanzania have created a lot of economic problems to large families, since children are no longer an economic asset. Many people nowadays have small or no farm and especially for those who live in urban areas. The income of large families in urban areas is not usually enough to take care of the families' needs and requirements. The quantity and quality of food the family eats depends largely on its income, however, in the rural households, consumption is largely a function of food supply. Families eat what they manage to produce, store and prepare (Jonsson 1986). Amount of food per meal is closely related to a number of persons sharing the meal. Therefore, if the quantity of food is small and is shared by many the family will then be underfed (Mosha 1983).

Mohmoud (1983), in his study of the relationship between malnutrition and family size, found that the size of the family has influence on rate of malnutrition, as more malnourished children were found in large families. The result of low food production plus lack of purchasing power result in little and poor food consumed by children and of course this causes malnutrition and poor health (Mosha 1983).

A study by Jana (1981) on parity of the mother and breast-feeding showed that mothers of higher parity breast feed longer (24 months) compared to mothers of lower parity (18 months). The findings showed that infections

and anaemia are prevalent among many mothers during pregnancy and those with high parity or poor child spacing tend to be the obvious victims.

Nguma et al (1987) pointed out that poor child spacing in most developing countries tend to be just the start of a long chain of health complications affecting not only the mother and child but the whole family. Too close pregnancies and consequent lactation depletes the mothers nutritionally. The mother, having been poorly nourished during pregnancy may not be able to breast-feed long enough, thus complementary feeding may be needed at a very early age. This puts the child at high risk to various infections making him susceptible to malnutrition quite early in life. All those problems will surely deplete the family resources to meet the costs for the care and other needs for the infant (that is, milk substitutes and other supplementary feeds).

Population factors have a direct influence on the health and welfare of the individual and the family. It has been clearly pointed out that too many children, too many pregnancies, and pregnancies that are too closely spaced are not conducive to an optimal level of health. Many families have more children than they can feed. Repeated pregnancies have an adverse effect on the health of the mother and children. In many cases, the mother has to stop breast-feeding one baby in order to provide for the new born. This often leads to inadequate and

unbalanced nutrition for the older child. Limiting the size of the family may effectively contribute to improving health and welfare. As a result family planning is an important factor in health promotion. This will favourably influence the health, development and well being of the family as a striking impact on mothers and children (Jesudas 1987).

PEM among children is more prevalent when siblings are closely spaced. When a new pregnancy follows within a year of delivery the cessation of breast-feeding frequently leads to PEM and probably to the death of the child (Taban 1987). The rate of population growth in Tanzania, currently at 2.8 percent per annum is high (Tanzania census 1988). If the rate would continue, the population would double in less than 25 years. The consequences of this are detrimental to the health of children.

Age of mother contributes to the nutritional status of a child. Young mothers have a psychological feeling that they are not able to take good care of their children. They are still not mentally mature. This can result in the poor care of the baby which leads to malnutrition. For the older mothers malnutrition cases may also be high, especially if the children are too closely spaced. The mother is too busy to care for the children especially when several children are below 5 years (Sarakikya et al 1987).

2.4.4 Relationship between Diseases and Child Malnutrition

The vertical health interventions through mass immunization and medical therapy produced the initial break through in the control of mortality without significant increase in the living standards or nutritional conditions. The major diseases for the children, such as smallpox, whooping cough, polio, tetanus, measles, respiratory tract infection, cholera and malaria that contributed to the majority of deaths have been brought under control with small-pox completely eradicated (UNICEF 1985a).

Other diseases may sometimes also play an important role in an already poorly nourished child (Mata 1980). The most important of these are gastrointestinal infections which often causes diarrhoea. This might prevent proper absorption of nutrients and sometimes result in vomiting and thus loss of food hence malnutrition (Biondo et al 1987; TFNC 1988).

Infection increases the need for several nutrients. Yet during a period of infection or other kinds of illness the child's appetite is often low and if the child's previous dietary history was poor then serious malnutrition can occur (FAO 1984). This effect is more serious among young children during the weaning period (TFNC 1987). Infections also contribute to deficiencies of other nutrients by decreasing food intake (Ryan 1984;

Mhando 1985; TFNC 1988). Energy requirement during infection can be double the normal due to the increase in basal metabolism (Mata 1981), where increased demand for glucose can result in depletion of muscle and liver glycogen (Aykroyd 1984; and Lorri 1985).

Measles also imposes a severe nutritional stress (Bantje 1980; FAO 1984; UNICEF 1985a). A number of studies from Africa and South America have suggested that measles in an undernourished child precipitates Kwashiorkor (Jellife 1979). The association of chronic gastroenteritis and Marasmus was also documented by Mata (1981) and Munubi (1987). FAO (1985) reported that infections can affect the level of intake in a number of vitamins. For example, keratomalacia condition is an infection in children with latent vitamin A deficiency.

Mrisho (1987) noted that acute infections affect iron metabolism, while chronic infections in general shorten the erythrocyte life span. Malaria and hookworm are known to produce iron deficiency as a result of iron loss (Mata 1981). Reports by Yambi (1984) and Bantje (1981) indicated that infections may interfere with the metabolism of electrolyte such as calcium and phosphorus, and that diarrhoea, causes potassium and chloride loss. Electrolyte imbalance resulting from diarrhoea is of major clinical significance in many developing countries, because dehydration can occur easily in an infant, and can result in death if it is not treated properly and promptly

(Mrisho 1987).

A sick child cannot play and benefit from stimuli of his surrounding. Often malnourished children of three to four years are unable to walk and talk (FAO 1984). It will take long for such a child to recover, if at all possible, and this will hamper his progress in school. A sick child has a poor appetite, so the sickness reinforces the malnutrition and vice versa (TFNC 1980). In this case, life expectancy is still much lower and infant and child mortality rates much higher in developing than in developed countries because of a combination of diseases and malnutrition (FAO 1984).

2.4.5 Relationship between Employment, Marital Status and Child Malnutrition

2.4.5.1 Employment: Carloni (1981) studied the effect of maternal employment on child nutrition. From this study it was found that maternal employment affects child nutrition in several ways. It can mean additional income available for household food expenditure or the mother has less time available for breast-feeding and the preparation of special infant weaning foods. Even when food is available, women have less time to prepare it due to long working hours and other home activities (Tafari et al 1980; Galvin 1985; Nestle 1985).

Popkin (1980) reported in a study from the Philippines that the negative effect of mother's

employment found in the lower income groups was related to the difficulties these mothers had in getting good child care-takers when they were away at work. Child care was to a large extent provided by older children. However, the higher income households were more likely to be able to afford to have older persons, particularly relatives outside the nuclear family, to care for the small children (Popkin 1980). Mascarenhas (1984) reported that nutrition seemed to be worse in the households where women were working as casual labourers.

Leslie (1985) reviewed studies about mothers working in different kinds of occupations. The findings showed no decline in the prevalence of breast-feeding as a result of mothers' working status. However working mothers tended to shift from exclusive breast-feeding to mixed (supplementary food and breast-milk) feeding.

In urban settings, the relationship between maternal employment and nutritional status of children is less evident. Yambi and Bantje (1980), in a study of infant feeding in Dar es Salaam, concluded that there was no relationship between maternal employment and the nutritional status of children. It was found that maternal employment increases the total income available for household food expenditure but not the percentage spent on food. However, Carloni (1981) found a significant relationship between women's participation in daily food purchasing and their wage employment

particularly among lower socio-economic groups.

2.4.5.2 Marital Status of the Mother: Andrianzen et al (1972) studied the height quotients of children based on the marital status of the mother. The study covered mothers who had co-habited with several men thus bearing children having different fathers, mothers who had co-habited with only one man, mothers who had been legally married by religious ceremony, civil ceremony or both. The authors concluded that "it was surprising not to find any significant differences in height in children among the first two groups". However, marked advantages existed in favour of those children whose parents had been legally married.

In a study from Zambia, Kumar (1985) compared the nutritional status of children from different types of households. It was found that on the average the nutritional status of children in female headed households was lower than the rest, however, when compared within a given income level it was higher. Brown (1981) categorically noted that women who were heads of households (unmarried, divorced, widowed and those whose husbands migrated to urban areas) were among the poorest.

2.4.6 Relationship between Food Distribution within the Household, Food Availability, Types of Crops Grown and Child Malnutrition

2.4.6.1 Food Distribution with the Household and Food Availability: The world food shortage has been growing more acute in recent years, as food production in developing countries has failed to keep pace with the rise in population (UNICEF 1984). TFNC (1986) showed that an insufficient food intake is related to insufficient food production, low income, difficult access to the market, workload of the women who have not enough time for preparing meals. Once agriculturists understand the nutritional needs of the community they will be able to target agricultural production and distribution by influencing cropping patterns, sale and shipment of food, to better meet the nutritional needs of the population. Mechanization, use of high-yielding varieties, fertilizers, irrigation, multiple cropping and intensive animal husbandry all increase productivity (TFNC 1985). Improving the way families store and process food can highly improve food security (FAO 1982a).

In many parts of the world inadequate food consumption is responsible for a reduction of peoples capacity for work. Also supplying food alone does not account to preventing malnutrition. Disease treatment and prevention, education and creation of work are equally essential (Jonsson 1986). Within households in developing

countries, it is the men, the primary earners of income, who often get first priority in allocation of food, and when food shortages are especially acute, the women and children may be the most deprived. Children's malnutrition is also affected by their inability to digest sufficient food when starchy foods are the main staple. FAO (1980) has estimated that perhaps one-half of the young children in the developing countries may suffer in varying degrees from inadequate nutrition.

FAO (1982a) argued that the most difficult problems are not those of increasing production of food, but of distributing it properly. Although malnutrition can result when the intake of any essential food element is too low, most of the world's underfed suffer primarily from inadequate caloric intake, which for the developing countries is clearly linked to low incomes. Unfortunately, those most vulnerable to undernutrition are the young children, child bearing women and the old. These are usually economically dependent and are excluded from political power and high cultural status.

Nutritional survey done in Bangladesh suggested that within households, food is inequitably divided among household members in relation to their nutritional requirements. Women and girls are disadvantaged in comparison to men and boys. This leads to higher incidence of severe malnutrition among women and girls and

endless female infant mortality. Age and gender are found to influence consumption patterns within the household (Carloni 1981; Rizvi 1983). The same phenomenon was observed in Sri Lanka where the poor women took pride in being able to provide their husbands and children with satisfying and adequate meals every day, even if they had to work extra hours or reduce their own food intake (Wander and Holmboe-Ottesen 1984).

Katona-Apte (1975) describes how women from Southern India feed their husbands first, then the children (boys before the girls) and only then do they think of themselves. The best and most nourishing portions of the food are served to males. Maletnlema et al (1974) summarized the results from food consumption surveys in 5 villages in different regions of Tanzania and concluded that "food is made by women for men and often the better share in quality and quantity is given to men".

Anwar and Ijaz (1984) found a clear subordinate position of women with regard to intra-familial distribution of food. Both husbands and wives were asked which family members needed the most healthful foods, and both responded that husbands needed such foods the most. The food needs of infants were ranked much lower, followed by the elders. Wives were almost never mentioned as being the ones needing the most healthful foods. Schofield (1979) summarised the results of surveys from 898 villages around the world and found that in the family food

distributive system, priority is usually given to males rather than children and wives.

2.4.6.2 Types of the Crops Cultivated: The introduction of cash crop may affect food production. The effect on the food and nutrition situation may vary depending on factors such as the degree of economic gain, the extent to which food production is still maintained as well as the effect of women's work and decision-making power in relation to the food chain (Kumar 1985).

In another study from Tanzania, Jakobsen (1978) related children's nutritional status to cash crop production. He found that the relationship represented a U-shaped curve. The nutritional status of children from households involved in subsistence farming was on the average better than among children from poor households involved in cash crop production or wage labour on commercial farms. However, with increasing income from cash crop production the incidence of malnutrition decreased so that children's nutritional status among the well to do cash crop farmers was better than among the subsistence farmers.

Changes from one type of subsistence food production to another may also affect the nutritional situation of the household. Most development work in improving agricultural production has been on so called "major" crops. These are usually cereal crops, such as maize,

rice and wheat. In many cases the intensification of cereal crops is at the expense of horticultural crops. The importance of horticultural crops for nutrition have been pointed out in recent studies and have now attracted the attention of policy makers (Garibaldi 1983; FAO 1983; Longhurst 1983). Longhurst (1983) pointed out that horticultural crops fill important gaps at certain times of the year. The mix of production and timing of horticultural crops are thus important for the food and nutrition situation of rural households.

2.4.7 Relationship between Birth Weight, Weight-for-Age and Child Malnutrition

Birth weight of the children reflects the nutritional status of their mothers during the period of pregnancy. Birth weight of the child has been found to have an effect on future physical and mental development as well (Materu 1983).

A survey of dietary intake of women in Coastal Tanzania revealed that average daily energy intake was 1850 k/cal and that of protein was 51.5 gm. Iron intake in the diet ranged from 10 - 16.2 mg per day (Ebrahim 1983). A significant correlation was seen between the energy intake of the mother and the size of the baby.

A similar study conducted in four Guatemalan villages showed that the mean intake of calories and protein during pregnancy was 1500 k/cal and 40 gm respectively (Ebrahim

1983). The average maternal height in rural Guatemala was 143 cm. The average weight gain in pregnancy was 7 kg which is about half of that in well nourished women in affluent societies. The mean birth weight was low at 3 kg and of 39 infants with normal gestational age about a third weighed 2.5 kg or less. Dietary histories again indicated a close association between food intake and the weight of the baby at birth (Ebrahim 1983). The prevalence of low birth weight in Tanzania is between 10 - 25 percent. This means that about one-fifth or 380 out of 1900 babies born everyday in Tanzania begin their lives with a birth weight which is too low for normal growth and development (Kavishe 1984).

A number of investigations have suggested that a high level of work activity during pregnancy adversely influences the birth weight of the child. Lower birth weight is likely to be an important factor in combination with low food intake. In Tanzania, seasonal changes in birth weights and growth rate of children that are due to fluctuations in the amount of food available have been demonstrated (Tafari et at 1980; Bantje 1980).

Low weight gain in early infancy is the single most characteristic sign of PEM. It is present long before other physical and biochemical signs appear. For that matter low weight gain constitutes clinical history of deficit food intake, the main guide in establishment of the diagnosis. Weight in relation to age was chosen as

the measure of malnutrition as it is the measurement least subjected to error. Children are grouped as malnourished when they are underweight. This is referring to FAO weight for-age charts used by (MCH) centres to assess the growth progress of children under five years of age (Tafari et al 1980).

A relationship between high workload and low birth weight was reported in India (Rajagopalan et al 1981). Another study by Tafari et al (1980) from Ethiopia confirms these results, that women engaged in heavy labour had a weight gain in pregnancy of 3.3 kg while less active mothers gained 5.9 kg. The difference in the mothers physical activity also appeared in the birth weight of the children being delivered at full term. The "heavy work" children weighed 3060 grams, while the "less activity" children weighed 3270 grams. It has been shown that low birth weight is caused by a combination of high workload, low food availability and increase in infectious diseases (Hamilton et al 1984).

The low birth weight may have implications for children's nutritional status later on in life. Some malnourished infants gain weight rapidly after birth provided a satisfactory nutritional input is maintained. Thus the mother's nutritional and working conditions may have varying impact on children's nutritional status (Perera 1986).

CHAPTER THREE

METHODOLOGY

3.1 The Location of the Study

The study was conducted in Morogoro Urban District with six MCH clinics including: Morogoro Government Hospital, Morogoro Government Hospital - NURU, Sabasaba Hospital, Uhuru, Kiwanja cha Ndege and Tumbaku.

Morogoro Urban District is one of five Districts of Morogoro Region. The others are Morogoro Rural, Kilosa, Ulanga and Kilombero. The District lies between Latitude 5° and 7°40' South and Longitudes 37°10' and 38°33' East of Greenwich meridian.

Morogoro Municipality is situated along the Dar es Salaam - Zambia road. The town is also served by the Kigoma - Dar es Salaam railway. Morogoro is the nearest biggest urban area to Dar es Salaam. It developed as one of the major suppliers of fruits and vegetables to Dar es Salaam market due to its favourable climatic conditions. The socio- economic setting in Morogoro town does not seem to differ much from other towns of similar size in Tanzania. A typical feature of the town is the central market. This dominates the sale of fruits and vegetables. It also serves as a whole sale agency for small markets and shops in town.

Early in the morning between four and five one can see people carrying produce on their heads bound for

Morogoro market. Head transport can involve long distance especially from the mountain area near the town where there are no reliable means of transportation. From places far away the produce is transported by motor vehicles.

It is not only the rural population that supplies the agricultural products. A large section of the population living in the town has small farms or fields outside town. Sometimes buses carry these people out to their fields and which then transport the produce to town. People staying in Morogoro town are employed in various sectors of the economy. These are: Agriculture, Manufacturing, Construction, Electricity and Water, Trade and Commerce, Communication and Transport, Government and Community services. The local market is the major source of food for the people residing in Morogoro urban.

The main types of fuel used in these areas are charcoal and kerosine and very few people use firewood while a very small portion of the population use electricity or gas. Constraints in the use of these sources of fuels are related to costs, availability and reliability. This can limit the number of times the mother is able to cook in a day.

Most popular staples in the area are maize and rice. The most commonly used animal protein rich foods are fish and beef. Beans and peas are the most eaten legumes. The common vegetables are wild spinach, tomatoes, onions and

cassava leaves. Fruits are widely available at the market place throughout the year but with highly fluctuating prices. Most mothers use coconut in place of cooking fat in their cooking due to high prices of cooking fats or oil available in shops. Green vegetables are fairly popular in many households but fruits are less consumed. The most popular weaning food is porridge which is made from maize flour.

Morogoro Urban was chosen for this study, firstly, due to its convenience for the researcher; secondly, an interest to know the rate of malnutrition among under five children in the area which has not been well studied, and thirdly, the information gathered might shed light on how to tackle the malnutrition problem.

3.2 Research Design

The cross-sectional design was considered favourable to this study because of the limited time available for data collection. Such a design according to Babbie (1973) and Bailey (1978):

(a) Allows data to be collected at a single point in time. In this study data were collected within one period of the research without repetition.

(b) Is used to determine relationship between variables at a particular time.

(c) Can be used for descriptive purposes. Cross-sectional studies are used frequently to infer the

operation of causative factors (Johnston 1974).

3.3 Sampling Procedure

The population for the study consisted of mother-child pairs (children under 5). A purposive sampling technique has been adopted to select six MCH clinics based on the number of mother-child pairs attending on a specific clinic day and also its convenient location within Morogoro Urban. The sample size was 200 mother-child pairs. Two cases were missing during data analysis therefore the final sample size was 198 mother-child pairs. For the NURU, all mother-child pairs admitted with malnourished children below five years of age were included in the sample. The list of MCH clinics covered in this study is shown in Appendix A.

3.4 Sampling Technique

A reconnaissance visit was made to determine the total number of mother-child pairs in each clinic. Each clinic was given an appropriate proportion of the sample depending on the number of mother-child pairs attended. The total number of mother child pairs present was determined by counting the children's clinic cards. Every mother present was allowed to pick a piece of paper from a box and the ones who picked "yes" were chosen for the sample. Ten percent of the sample size per each malnourished and well-nourished children were chosen for

follow-up interviews and/or observations. The follow-up helped to cross check the answers given during the interview. This helped in making the conclusion on the comparison of factors associated with malnourished and well-nourished children.

3.5 Instrumentation

(a) Structured questionnaires: One for MCH Coordinators and Nurses; the second for NURU Workers/Nurses and the third for mother-child pairs have been the main instruments used in collecting information (Appendix B).

Other instruments apart from questionnaires were:-

(b) Review records in the MCH Clinics files, official files at TFNC, Morogoro Municipal, Regional Development Director's office (RDD's), UNICEF and Sokoine University of Agriculture library.

(c) A diary to record data obtained informally through observations.

(d) Informal discussion with mother-child pairs (mothers with underfive children), especially during follow-up time. Also informal discussion with MCH coordinators and nurses, nutritionists, community workers and other related government officials.

3.6 Pre-testing of the Instrument

Validity: Validity of an instrument refers to the

extent to which it measures what it is intended to measure. To ensure validity, the questionnaires were administered to five members of staff of Sokoine University of Agriculture for the purpose of giving comments on validity of the questions.

Furthermore, ten mothers were interviewed at Morogoro Government Hospital MCH Clinic. These mothers were not included in the final study sample size. The main reason of pre-testing was to assist in making modifications in some questions before the actual data collection. The questionnaires which were used in the study are shown in Appendix B. Data for nutritional status were collected by utilizing anthropometric measurements (weight/age) of a selected sample of under five children.

3.7 Data Analysis

Data collected from the respondents were arranged according to the way the questions were organized for the different variables. The gathered data from the mother-child pairs (under 5 years) were coded and recorded on computer forms before they were transferred to computer files at Sokoine University of Agriculture, Morogoro.

Cross tabulations were done and for every variable descriptive statistics such as frequencies, means, media, standard deviation and percentages were calculated. Chi-square as by Karl Pearson 1900 (Hogg and Tanis 1977) and Correlation were analyzed. Correlation analyses was done

to establish the degree of association of different variables to nutritional status. Chi-square test was used to establish if there was any statistical relationship among variables.

Multiple regression and Path Coefficient analysis were done. Multiple regression analysis was very important in showing the correlations of the factors. While Path Coefficient was used for ranking the factors and showing the correlations of the factors. In this case the relative strength of association between the different variables were established. In this study, the SPSS/PC+ the statistical package for IBM PC (1/1/80) was used to analyze the data.

CHAPTER IV

RESULTS

This chapter presents the results of the study. The purpose of this study was to examine the prevalence of child malnutrition and factors associated with it in Morogoro Urban. For specific objectives refer to Section 1.3 on page 5 of this report.

4.1 The Most Prevalent Forms of Malnutrition in Morogoro Urban

The most prevalent forms of malnutrition in Morogoro Urban for the months of May, June and July, 1990 were under-weight (80.1 percent) followed by Kwashiorkor (10.2 percent) and Marasmus (9.1 percent). Table 2 summarizes the reported malnutrition cases in percentages in the months of May, June and July, 1990.

Kiwanja cha Ndege and Tumbaku MCH clinics represent high percentage of malnourished children within this period compared with other clinics. There was a high percentage of malnourished children in May (37.6 percent) than in June (30.8 percent) and July (31.6 percent). Most of the admitted cases at NURU were Kwashiorkor and Marasmus.

Table 2: Reported Malnutrition Cases (in percentage) in May, June and July (1990) in Five MCH Clinics and Admission Cases at NURU in Morogoro Urban.

Months	MCH Clinics	Kwashi-orkor	Marasmus	Marasmic/ Kwashi-orkor	Under-weight	Total
May	Uhuru	-	0.8	-	4.9	5.7
	Sabasaba	-	-	-	4.5	4.5
	Tumbaku	1.7	2.6	0.2	9.8	14.3
	K/Ndege	-	-	-	8.9	8.9
	Moro. Govt.	-	-	-	1.5	1.5
	NURU	2.2	0.5	-	-	2.7
Sub-total		3.9	3.9	0.2	29.6	37.6
June	Uhuru	-	1.3	-	4.7	6.0
	Sabasaba	0.3	-	-	2.4	2.7
	Tumbaku	0.9	1.2	0.2	5.5	7.8
	K/Ndege	-	-	-	10.8	10.8
	Moro.Govt.	0.2	-	-	0.7	0.9
	NURU	2.3	0.3	-	-	2.6
Sub-total		3.7	2.8	0.2	24.1	30.8
July	Uhuru	-	1.3	-	5.4	6.7
	Sabasaba	0.5	-	-	5.5	6.0
	Tumbaku	1.2	0.9	0.2	5.2	7.5
	K/Ndege	-	-	-	10.3	10.3
	Moro. Govt.	-	-	-	-	-
	NURU	0.9	0.2	-	-	1.1
Sub-total		2.6	2.4	0.2	26.4	31.6
Grand Total		**10.2**	**9.1**	**0.6**	**80.1**	**100**

4.2 The Rate of Under five Children Suffering from Malnutrition in Morogoro Urban

The rate of under five children suffering from malnutrition in Morogoro Urban has been calculated by

using the following formula:

$$\frac{\text{Number of under five children malnourished}}{\text{Number of total under five children surveyed}} \times 100$$

Well-come Trust Classification as defined in chapter 2.2 was used to identify and separate the well-nourished and malnourished children, based on anthropometric measurements (weight-for-age) and presence or absence of oedema.

The results showed that slightly more than a quarter (25.3 percent) of the children were mildly malnourished and 5.1 percent were severely malnourished. Therefore the total rate of malnutrition was estimated to be 30.4 percent (Refer to Appendix C for the formula used in the calculation).

4.3 Factors Associated with Malnourished and Well-nourished Children in Morogoro Urban

The factors associated with malnourished and well-nourished children were determined by the use of a questionnaire (Appendix B). The questionnaire sought to determine the following:

(1) The relationship between level of income, level of education, beliefs and taboos and child malnutrition;

(2) Relationship between feeding frequency, feeding methods, the type of weaning food and child

malnutrition;

(3) Relationship between workload, parity and age of the mother and child malnutrition and

(4) Relationship between diseases and child malnutrition.

Frequencies and percentages of responses for the above factors were calculated. Some of these factors are presented by cross-tabulation (Tables 3 - 29) and (Appendix D1 - D10). Chi-square was calculated, multiple regression and Path Coefficient were analyzed.

4.3.1 Relationship between Level of Income, Level of Education, Beliefs and Taboos and Child Malnutrition

4.3.1.1 Level of Income: Earning from Salary and from Income Generating Projects per Month

The results showed that 81.8 percent of the mothers were earning salaries of Tsh. 2,000 to Tsh. 5,000 per month. Twelve point one (12.1) percent received Tsh. 5,000 and above per month as salary. Six point one (6.1) percent of the mothers received a salary below Tsh. 2,000 per month. Mothers receiving salary were employed as health workers, teachers, extension workers, secretaries and others.

In the group of mothers who earned Tsh. 2,000 to Tsh. 5,000 per month, 70.4 percent of their children were well-

nourished while 29.6 percent were mildly malnourished. In the category of mothers who received Tsh. 5,000 and above per month, there was not a single case of malnutrition. While mothers who received below Tsh. 2,000 per month, all their children were malnourished (Refer to Table 3).

Majority (56.9 percent) of the mothers had IGP earning between Tsh. 2,000 to Tsh. 5,000 per month. Twenty nine point two (29.2) percent of the mothers earned above Tsh. 5,000 from IGP. Thirteen point nine (13.9) percent of the mothers earned below Tsh 2,000 per month from IGP.

In the group of mothers who earned Tsh. 2,000 to Tsh. 5,000 per month, 78.0 percent of their children were well-nourished, 19.5 percent were mildly malnourished and 2.5 percent were severely malnourished. In the category of mothers who earned Tsh. 5,000 and above per month from IGP, 76.2 percent of their children were well-nourished, 23.8 percent were mildly malnourished and there were no cases of severe malnutrition. Mothers who earned below Tsh. 2,000 per month from IGP, 70.0 percent of their children were well-nourished and 30.0 percent were mildly malnourished (Refer to Table 3).

Table 3: Level of Income (Salary and Income from IGP) as Associated with Malnourished and Well-nourished Children (percentage)

Nutritional Status	Level of income per month (Tsh)							
	Below 2,000		2,000 to 5,000		5,000 and above		Total	
	Salary	IGP	Salary	IGP	Salary	IGP	Salary	IGP
Well-nourished children	-	70.0 (7)	70.4 (19)	78.0 (32)	100.0 (4)	76.2 (16)	69.7 (23)	76.4 (55)
Mildly malnourished children	100.0 (2)	30.0 (3)	29.6 (8)	19.5 (8)	-	23.8 (5)	30.3 (10)	22.2 (16)
Severely malnourished children	-	-	-	2.5 (1)	-	-	-	1.4 (1)
Total	100.0 (2)	100.0 (10)	100.0 (27)	100.0 (41)	100.0 (4)	100.0 (21)	100.0 (33)[a]	100.0 (72)[b]

Keys: (): Numbers in brackets mean frequencies of responses.

-: No responses

a: Identified working mothers in the sample

b: Identified mothers engaged in IGP in the sample.

4.3.1.2 Level of Education of the Mother

The results are summarized in Table 4, showing how mothers' level of education is associated with

malnourished and well-nourished children. More than a half (59.4 percent) of the mothers had (Std I - VII - VIII) level of education. Mothers who did not go to school were 20.8 percent of those studied. Thirteen (13.0) percent had an education of std. i - iv. Mothers who completed secondary school education were 5.1 percent. Few of the mothers (0.5 percent) had university education. While 1.0 percent of the mothers had adult education.

Most of the malnourished children belonged to mothers with primary school education (std I - IV). In this category, 65.4 percent of the children were well-nourished, 26.9 percent were mildly malnourished and 7.7 percent were severely malnourished. Regarding mothers who did not go to school, 65.9 percent of their children were well-nourished, 26.8 percent were mildly malnourished and 7.3 percent were severely malnourished. In the category of mothers with standard (I - VII - VIII) education, 71.2 percent of the children were well-nourished, 24.6 percent were mildly malnourished and 4.2 percent were severely malnourished (Refer to Table 4).

Table 4: Mothers' Level of Education as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Level of Education						
	Did not go to School	Adult education	Primary education (Std i-iv)	Primary education (Std i-vii-viii)	Secondary education	University education	Total
Well-nourished children	65.9 (27)	100.0 (2)	65.4 (17)	71.2 (84)	70.0 (7)	100.0 (1)	69.7 (138)
Mildly malnourished children	26.8 (11)	-	26.9 (7)	24.6 (29)	30.0 (3)	-	25.3 (50)
Severely malnourished children	7.3 (3)	-	7.7 (2)	4.2 (5)	-	-	5.0 (10)
Total (198)[a]	**100.0 (41)**	**100.0 (2)**	**100.0 (26)**	**100.0 (118)**	**100.0 (10)**	**100.0 (1)**	**100.0**

Keys: (): Numbers in brackets mean frequencies of responses.

-: No responses

a: Total sampled mothers.

4.3.1.3 Beliefs and Taboos

4.3.1.3.1 Breast-feeding when the Child is Sick

Results of the study on beliefs and taboos as they apply to breast-feeding when the child is sick showed that 93.8 percent of the mothers breast-fed when their children were sick. Only 6.2 percent did not breast-feed when their children were sick. Of those children who were

breast-fed when they were sick, 68.8 percent were well-nourished, 25.8 percent were mildly malnourished and 5.4 percent were severely malnourished (Table 5).

Table 5: Breast-feeding and Supplementary Feeding the Child During Illness as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Brest-feeding and Supplementary Feeding					
	Breast-feeding	Not Breast-feeding	Supple-mentary feeding	Not Supple-mentary feeding	Total Breast-feeding and not breast-feeding	Total Supple-mentary feeding and not supple-mentary feeding
Well-nourished children	68.8 (128)	91.7 (11)	69.4 (129)	75.0 (9)	70.2 (139)	69.7 (138)
Mildly malno-urished children	25.8 (48)	8.3 (1)	25.8 (48)	16.7 (2)	24.7 (49)	25.2 (50)
Severely malnourished children	5.4 (10)	-	4.8 (9)	8.3 (1)	5.1 (10)	5.1 (10)
Total	**100.0 (186)**	**100.0 (12)**	**100.0 (186)**	**100.0 (12)**	**100.0 (198)**	**100.0 (198)**

Keys: (): Numbers in brackets mean frequencies of responses

-: No response

4.3.1.3.2 Feeding the Child during Illness

In this study 93.8 percent of the mothers fed their children with supplementary foods when they were sick.

Six point two (6.2) percent of the children were not fed with supplementary foods when they were sick. Of those children who were fed when they were sick 69.4 percent were well-nourished, 25.8 percent were mildly malnourished and 4.8 percent were severely malnourished. Eight point three (8.3) percent of the children who were not fed when they were sick were severely malnourished and 16.7 percent were mildly malnourished (Table 5).

4.3.2 Relationship between Feeding Frequency, Feeding Methods, the Type of Weaning Foods and Child Malnutrition

4.3.2.1 Feeding Frequency

4.3.2.1.1 Feeding Frequency of Foods other than Milk

The results of feeding frequency of foods other than milk showed that less than half (47.1 percent) of mothers fed their children three times per day. The mothers who fed their children twice per day were 30.5 percent. Children who were fed four times per day were 13.4 percent. Few (2.1 percent) children were fed more than five times per day and 6.9 percent of the children were fed once per day.

Twenty five (25.0) percent of the mildly malnourished children and 2.3 percent severely malnourished children belonged to the mothers who fed their children three times per day. In this category 72.7 percent were well-nourished children. In the category of children who were

fed two times per day 15.8 percent were mildly malnourished, 10.5 percent were severely malnourished and 73.7 percent were well-nourished (Table 6).

Table 6: Feeding Frequency of Foods other than Milk as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Feeding Frequency					
	Once per day	Twice per day	Three times per day	Four times per day	More than five times per day	Total
Well-nourished children	69.2 (9)	73.7 (42)	72.7 (64)	52.0 (13)	25.0 (1)	69.0 (129)
Mildly malnourished	23.1 (3)	15.8 (9)	25.0 (22)	44.0 (11)	75.0 (3)	25.7 (48)
Severely malnourished	7.7 (1)	10.5 (6)	2.3 (2)	4.0 (1)	-	5.3 (10)
Total	**100.0 (13)**	**100.0 (57)**	**100.0 (88)**	**100.0 (25)**	**100.0 (4)**	**100.0 (187)[a]**

Keys: (): Number in brackets mean frequencies of responses.

-: No responses

a: The total number of children in the sample who were already weaned.

4.3.2.1.2 Breast-feeding Frequency during the Night and Day

In this study 50.8 percent of the mothers breast-fed

their children on demand during the night time. Four point two (4.2) percent of the children were breast-fed once during the night. Some of the children (15.6 percent) were breast-fed twice during the night. The children who were breast-fed three times during the night were 19.2 percent and 7.2 percent were breast-fed four times during the night. Two point four (2.4) percent of the children were breast-fed five times during the night and a few (0.6 percent) were not breast-fed during the night.

For the children who were fed on demand, 70.5 percent were well-nourished children, 25.0 percent were mildly malnourished and 4.5 percent were severely malnourished. The children who were breast-fed three times at night, 31.3 percent of them were mildly malnourished, 6.2 percent were severely malnourished and 62.5 percent were well-nourished (Refer to Table 7).

A high percentage (65.9) of the mothers were breast-feeding their children on demand during the day time. One point eight (1.8) percent of the children were breast-fed once during the day, 5.3 percent were breast fed twice, 9.4 percent were breast-fed thrice, 13.5 percent were breast- fed four times and 4.1 percent were breast-fed five times during the day. For the children who were breast-fed on demand during the day, 67.0 percent were well-nourished, 25.9 percent were mildly malnourished and 7.1 percent were severely malnourished (Table 7).

Table 7: Breast-feeding Frequency during the Night and Day as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Feeding Frequency															
	On demand		Once		Twice		Three times		Four times		Five times		No feeding		Total	
	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day
Well-nourished Children	70.5 (62)	67.0 (75)	71.4 (5)	100.0 (3)	80.8 (21)	66.7 (6)	62.5 (20)	68.8 (11)	66.7 (8)	91.3 (21)	100.0 (4)	71.4 (5)	100.0 (1)	-	71.2 (121)	71.2 (121)
Mildly malnourished Children	25.0 (22)	25.9 (29)	28.6 (2)	-	11.5 (3)	33.3 (3)	31.3 (10)	31.2 (5)	33.3 (4)	8.7 (2)	-	28.6 (2)	-	-	24.1 (41)	24.1 (41)
Severely malnourished Children	4.5 (4)	7.1 (8)	-	-	7.7 (2)	-	6.2 (2)	-	-	-	-	-	-	-	4.7 (8)	4.7 (8)
Total	100.0 (88)	100.0 (112)	100.0 (7)	100.0 (3)	100.0 (26)	100.0 (9)	100.0 (32)	100.0 (16)	100.0 (12)	100.0 (23)	100.0 (4)	100.0 (7)	100.0 (1)	-	100.0 (170)[a]	100.0 (170)[a]

Keys: (): Number in brackets mean frequencies of responses

-: No responses

a: Total number of children who were breast-feeding

4.3.2.2 Feeding Methods

4.3.2.2.1 Breast-feeding

The results from this study showed that 85.9 percent of the mothers were breast-feeding and only 14.1 percent were not breast-feeding. Majority (72.4 percent) of the children who were breast-fed were well-nourished while 23.5 percent were mildly malnourished and 4.1 percent were severely malnourished. Fifty seven point one (57.1) percent of the children who were not breast-fed were well-nourished, 35.7 percent were mildly malnourished and 7.2 percent were severely malnourished (Refer to Table 8).

(a) Commencement of Breast-feeding after Delivery

Less than a half (36.9 percent) of the mothers started breast-feeding within 1 - 3 hours after delivery, 22.8 percent started breast-feeding immediately after delivery and 8.8 percent started breast-feeding their children after 24 hours (as shown in Table 9). Seventy six point nine (76.9) percent of children who were breast-fed immediately after delivery were well-nourished, 17.9 percent were mildly malnourished and 5.2 percent were severely malnourished. Sixty point three (60.3) percent of the

well-nourished children were from mothers who breast-fed within 1-3 hours after delivery while 36.5 percent were mildly malnourished and 3.2 percent were severely malnourished (Table 9).

Table 8: Breast-feeding as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Breast-feeding		
	Breast-feeding	Not Breast-feeding	Total
Well-nourished children	72.4 (123)	57.1 (16)	70.2 (139)
Mildly malnourished children	23.5 (40)	35.7 (10)	25.3 (50)
Severely malnourished children	4.1 (7)	7.2 (2)	4.5 (9)
Total	**100.0 (170)**	**100.0 (28)**	**100.0 (198)**

Key: ( ): Numbers in brackets mean frequencies of responses.

(b) Age of Cessation of Breast-Feeding

In this study the results showed that 46.4 percent of the children stopped breast-feeding at the age of 19 - 24 months and 42.8 percent stopped breast-feeding at the age of above 24 months. Only 3.6 percent and 7.2 percent of the children stopped breast-feeding at the age of 2 - 6 months and 13 - 18 months respectively.

In the category of children who stopped breast-feeding at the age above 24 months, 75.0 percent were well-nourished and 25.0 percent were mildly malnourished.

Table 9: Commencement of Breast-feeding after Delivery as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Time Lapse after Delivery										
	Immediately	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	Above 24	Total
Well-nourished children	76.9 (30)	60.3 (38)	63.2 (12)	90.0 (9)	75.0 (6)	66.7 (2)	-	50.0 (1)	88.9 (8)	86.6 (13)	70.0 (119)
Mildly malnourished children	17.9 (7)	36.5 (23)	26.3 (5)	10.0 (1)	25.0 (2)	33.3 (1)	50.0 (1)	50.0 (1)	11.1 (1)	6.7 (1)	25.3 (43)
Severely malnourished children	5.2 (2)	3.2 (2)	10.5 (2)	-	-	-	50.0 (1)	-	-	6.7 (1)	4.7 (8)
Total	100.0 (39)	100.0 (63)	100.0 (19)	100.0 (10)	100.0 (8)	100.0 (3)	100.0 (2)	100.0 (2)	100.0 (9)	100.0 (15)	100.0 (170)[a]

Keys: (): Numbers in brackets mean frequencies of responses

-: No responses

a: Total number of children in the sample who were breast-feeding.

For those children who stopped at the age of 19 - 24 months, 61.5 percent were well-nourished, 23.1 percent were mildly malnourished and 15.4 percent were severely malnourished.

In the group of children who stopped at the age of 2 - 6 months, all the children were mildly malnourished. The children who stopped breast-feeding at the age of 13 - 18 months 50.0 percent were well-nourished and 50.0 percent were mildly malnourished (Refer to Table 10).

Table 10: Age of Cessation of Breast-Feeding as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Age of Cessation of Breast-Feeding (months)						
	Less than 1 Month	2 - 6 Months	7 - 12 Months	13 - 18 Months	19 - 24 Months	Above 24 Months	Total
Well-nourished children	-	-	-	50.0 (1)	61.5 (8)	75.0 (9)	64.3 (18)
Mildly malnourished children	-	100.0 (1)	-	50.0 (1)	23.1 (3)	25.0 (3)	28.6 (8)
Severely malnourished children	-	-	-	-	15.4 (2)	-	7.1 (2)
Total	-	100.0 (1)	-	100.0 (2)	100.0 (13)	100.0 (12)	100.0 (28)[a]

Keys: (): Numbers in brackets mean frequencies of responses.

-: No responses

a: Total number of children in the sample who were not breast-feeding.

(c) Ways the Child was Stopped from Breast-Feeding

In this study 82.2 percent of the children were stopped breast-feeding abrupty. Less than a quarter (17.8 percent) of the children were stopped breast-feeding gradually. A fairly high percentage (40.0) of the

children who were stopped breast-feeding gradually were mildly malnourished. Also there was a high percentage of malnourished children among those children who stopped breast feeding abruptly (26.1 percent mildly malnourished and 8.7 percent severely malnourished) (Refer to Table 11).

Table 11: Ways the Child was Stopped Breast-feeding as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	**Ways the Child was Stopped from Breast-feeding**		
	Abruptly	Gradually	Total
Well-nourished children	65.2 (15)	60.0 (3)	64.3 (18)
Mildly malnourished children	26.1 (6)	40.0 (2)	28.6 (8)
Severely malnourished children	8.7 (2)	-	7.1 (2)
Total	**100.0 (23)**	**100.0 (5)**	**100.0 (28)[a]**

Keys: ( ): Numbers in brackets mean frequencies of responses

- : No responses

a : Total number of children in the sample who were not breast-feeding.

(d) Methods Used to Stop the Child from Breast-Feeding

The results from this study showed that the majority of the mothers (62.5 percent) stopped breast-feeding abruptly by covering their breasts with plasters. While 16.7 percent of the mothers applied unpleasant stuffs-material on the breasts and 16.6 percent stopped breast-feeding by separation of the child from the mother. Four point two (4.2) percent of the children were left to cry until they were tired.

A high percentage (50.0) of malnourished children belonged to the mothers who stopped breast-feeding by separation from their children. Also a fairly high percentage (26.7) of mildly malnourished children were observed among mothers who covered their breast with plasters while 13.3 percent were severely malnourished (Table 12).

4.3.2.2.2 Bottle-Feeding

(a) Treatment of Bottles after Feeding

Amongst the bottle-fed children a total of 58.8 percent were well-nourished while 41.2 percent were malnourished. Thirty five point two (35.2) percent of the children were fed in bottles washed only with water and soap, 29.5 percent were fed in bottles washed with water and boiled, 29.4 percent were fed in bottles washed with water, soap and boiled, while 5.9 percent were fed in bottles washed with only water.

Table 12: Methods Used to Stop the Child from Breast-Feeding as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Methods used to stop the child from breast-feeding				
	The baby was taken away from the mother	Application of unpleasant stuffs on the breasts	The breasts were covered with plasters	The baby was left to cry until it gets tired	Total
Well-nourished children	50.0 (2)	100.0 (4)	60.0 (9)	100.0 (1)	66.7 (16)
Mildly malnourished children	50.0 (2)	-	26.7 (4)	-	25.0 (6)
Severely malnourished children	-	-	13.3 (2)		8.3 (2)
Total	**100.0 (4)**	**100.0 (4)**	**100.0 (15)**	**100.0 (1)**	**100.0 (24)[a]**

Keys: (): Numbers in brackets mean frequencies of responses.

-: No responses

a: Total number of children in the sample who stopped from breast-feeding using the four identified methods.

A high percentage (60.0) of the malnourished children belonged to mothers who washed their bottles with water, soap and boiled. Fifty (50.0) percent each of malnourished and well-nourished children were observed to be of mothers who fed their children in bottles washed with water and soap (Refer to Table 13).

Table 13: Treatment of Feeding Bottles as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Treatment of Feeding Bottles				
	Washing with only water	Washing with water and soap	Washing with water and boiling	Washing with water, soap and boiling	Total
Well-nourished children	100.0 (1)	50.0 (3)	80.0 (4)	40.0 (2)	58.8 (10)
Mildly malnourished children	-	50.0 (3)	20.0 (1)	60.0 (3)	41.2 (7)
Total	**100.0 (1)**	**100.0 (6)**	**100.0 (5)**	**100.0 (5)**	**100.0 (17)[a]**

Keys: (): Numbers in brackets indicate frequencies of responses.

-: No responses

a: Total number of children in the sample who were bottle-fed.

(b) Types of Food Used in Bottle-Feeding

Different types of foods such as milk (45.8 percent), fruit juice (13.1 percent), porridge (11.2 percent), milk, fruit juice and porridge (5.6 percent), milk and water (11.2 percent), milk and porridge (13.1 percent) were used in bottle-feeding (Refer to Table 14).

Table 14: Types of Food Used in Bottle-Feeding as Associated with Well-nourished and Malnourished Children (percent)

Nutritional Status	Types of Foods Used in Bottle-feeding						
	Milk	Fruit juice	Porridge	Milk, Fruit juice and porri-dge	Milk and water	Milk and porri-dge	Total
Well-nourished children	62.5 (5)	100.0 (2)	50.0 (1)	-	50.0 (1)	100.0 (2)	64.7 (11)
Mildly malnourished children	37.5 (3)	-	50.0 (1)	100.0 (1)	50.0 (1)	-	35.3 (6)
Total	**100.0 (8)**	**100.0 (2)**	**100.0 (2)**	**100.0 (1)**	**100.0 (2)**	**100.0 (2)**	**100.0 (17)[a]**

Keys: (): Numbers in brackets indicate frequencies of responces.

-: No responses

a: Total number of children in the sample who were bottle-fed.

(c) The Use of Bottle-Feeding

The results showed that 91.4 percent of the children were not bottle-fed while 8.6 percent were bottle-fed. In the category of children who were not bottle-fed a higher percentage (70.2 percent) were well-nourished, 24.3 percent were mildly malnourished and 5.5 percent were severely malnourished. In the group of mothers using

bottle-feeding 64.7 percent of their children were well-nourished and 35.3 percent were mildly malnourished (Table 15).

Table 15: The Use of Bottle-Feeding as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Methods of Feeding		
	Bottle-feeding	Not bottle-feeding	Total
Well-nourished Children	64.7 (11)	70.2 (127)	69.7 (138)
Mildly malnourished Children	35.3 (6)	24.3 (44)	25.3 (50)
Severely malnourished Children	-	5.5 (10)	5.0 (10)
Total	**100.0 (17)**	**100.0 (181)**	**100.0 (198)**

Keys: ( ): Numbers in bracket indicates frequencies of responses.

- : No responses.

4.3.2.3 Type of Weaning Foods

The types of weaning foods used are listed in Table 16. It was found that 27.1 percent of mother-child pairs used maize flour porridge mixed with groundnut flour; 18.8 percent used maize flour mixed with groundnut flour, fish ("dagaa") flour and bean flour porridge; and 18.3 percent

of mothers used only maize flour porridge with water as weaning. Other types of food mixtures used as weaning foods are listed in Table 16. Very few mothers used "power flour" or fat and oil in weaning foods.

Twenty five point five (25.5) percent of the children fed with maize flour mixed with groundnut flour porridge were mildly malnourished, 3.9 percent were severely malnourished and 70.6 percent were well-nourished. Seventeen point six (17.6) percent of the children who were fed with maize flour porridge with water were mildly malnourished, 11.8 percent were severely malnourished and 70.6 percent were well-nourished.

Among the children who were fed with maize flour mixed with groundnut flour, fish ("dagaa") flour and bean flour porridge, 74.3 percent were well-nourished and 25.7 percent were mildly malnourished. The children who were fed with maize flour with milk porridge and maize flour with groundnut flour porridge, 80.0 percent were well-nourished while 20.0 percent were severely malnourished.

Table 16: Type of Weaning Foods as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Type of Weaning Food																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Total
Well-nourished Children	70.6 (24)	60.0 (3)	70.6 (36)	-	50.0 (1)	50.0 (1)	60.0 (3)	80.0 (4)	71.4 (10)	50.0 (1)	50.0 (1)	66.7 (2)	100.0 (3)	-	50.0 (1)	50.0 (1)	50.0 (1)	80.0 (8)	33.3 (1)	50.0 (1)	100.0 (2)	74.3 (26)	69.2 (130)
Mildly malnourished children	17.6 (6)	20.0 (1)	25.5 (13)	100.0 (1)	50.0 (1)	50.0 (1)	20.0 (1)	-	28.6 (4)	50.0 (1)	50.0 (1)	33.3 (1)	-	100.0 (1)	50.0 (1)	50.0 (1)	-	20.0 (2)	66.7 (2)	50.0 (1)	-	25.7 (9)	25.5 (48)
Severely malnourished children	11.8 (4)	20.0 (1)	3.9 (2)	-	-	-	20.0 (1)	20.0 (1)	-	-	-	-	-	-	-	-	50.0 (1)	-	-	-	-	-	5.3 (10)
TOTAL	100 (34)	100 (5)	100 (51)	100 (1)	100 (2)	100 (2)	100 (5)	100 (5)	100 (14)	100 (2)	100 (2)	100 (3)	100 (3)	100 (1)	100 (2)	100 (2)	100 (2)	100 (10)	100 (3)	100 (2)	100 (2)	100 (35)	100.0 (188)[a]

Keys: Refer to pages 93 and 94.

Key to Table 16

1. Maize flour porridge with water
2. Maize flour porridge with milk
3. Maize flour mixed with groundnut flour porridge
4. Maize flour porridge mixed with small fish ("dagaa").
5. Maize flour porridge mixed with vegetables
6. Mashed potatoes/bananas mixed with vegetables
7. Maize flour with groundnut porridge and maize flour porridge with vegetables.
8. Maize flour with milk porridge and maize flour with groundnut flour porridge.
9. Maize flour with milk and groundnut flour and "dagaa" flour porridge.
10. Maize flour with milk and eggyolk porridge
11. Maize flour and groundnut flour and egg yolk porridge
12. Maize flour porridge mixed with milk, groundnut and cooking oil/fat.
13. Maize flour mixed with milk, egg yolk "dagaa" and "power flour" porridge.
14. Potatoes or bananas and vegetables
15. Maize flour mixed with vegetables and fruits.
16. Maize flour mixed with fruit juice porridge
17. Maize flour porridge mixed with cooking oil or fat.
18. Any food suitable for adults
19. Maize flour mixed with groundnut, "dagaa" flour and power flour.
20. Maize flour mixed with "dagaa" flour and stiff "ugali"
21. Maize flour mixed with groundnut and "dagaa" flour porridge.

22. Maize flour mixed with groundnut, "dagaa" and bean flour porridge.

(): Numbers in brackets indicate frequencies of responses

-: No responses

a: Total number of children in a sample who have reached the weaning age.

4.3.2.3.1 Weaning Period

Less than a half (48.9 percent) of the mothers weaned their children at the age of 2-3 months. Forty six point two (46.2) percent of the mothers weaned their children at the age of 4 - 6 months. Four point four (4.4) percent of the mothers weaned their children at the age of less than a month. While 0.5 percent of the mothers weaned their children at the age of 7 - 9 months.

Among the children who were weaned at the age of 2-3 months, 73.4 percent were well-nourished, 24.5 percent mildly malnourished and 2.1 percent were severely malnourished. For the children who were weaned at the age of 4 - 6 months 25.9 percent were mildly malnourished, 8.2 percent were severely malnourished and 65.9 percent were well-nourished (Table 17).

Table 17: Weaning Period as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Weaning Period (Months)				
	Less than a Month	2 - 3 Months	4 - 6 Months	7 - 9 Months	Total
Well-nourished Children	75.0 (6)	73.4 (69)	65.9 (56)	-	69.7 (131)
Mildly malnourished Children	25.0 (2)	24.5 (23)	25.9 (22)	-	25.0 (47)
Severely malnourished Children	-	2.1 (2)	8.2 (7)	100.0 (1)	5.3 (10)
Total	**100.0 (8)**	**100.0 (94)**	**100.0 (85)**	**100.0 (1)**	**100.0 (188)[a]**

Keys: ( ): Numbers in brackets imply frequencies of responses

- : No responses

a : Total number of children in the sample who have reached the weaning age.

4.3.3 Relationship between Workload, Parity and Age of the Mother and Child Malnutrition

4.3.3.1 Workload of the Mother

4.3.3.1.1 Type of Helper in Performing Household Work

Findings from this study showed that 53.9 percent of the mothers had no helper in their homes, 16.8 percent

were helped by older children and 14.7 percent were helped by house-maids. Some (10.1 percent) of the mothers were assisted by relatives, 1.5 percent by aunts and 1.0 percent were helped by their husbands. One (1.0) percent of the mothers got help both from their older children and house-maids. Mothers who got help from both house-maids and husbands were 0.5 percent and from older children and mothers were 0.5 percent of the total (Table 18).

In the category of mothers with no helper in their homes, 21.5 percent of their children were mildly malnourished and 7.5 percent were severely malnourished. A high rate of malnutrition was also found amongst children whose mothers were helped by oder children in their homes (30.3 percent were mildly malnourished and 3.0 percent were severely malnourished). Amongst mothers who were helped by house-maids, 65.5 percent of the children were well-nourished and 34.5 percent were mildly malnourished.

Mothers who were helped by husbands, 50.0 percent of the children were well-nourished and the same percentage (50.0) were mildly malnourished (Refer to Table 18).

4.3.3.1.2 Types of Fuel Used for Cooking

The results showed that 33.0 percent of the mothers used charcoal for cooking, 26.6 percent used firewood, 5.1 percent used firewood and kerosine, 7.1 percent used

firewood and charcoal, 5.7 percent used kerosine, 3.6 percent used electricity and 3.1 percent used a combination of charcoal and electricity. A total of 15.3 percent of the mothers used a combination of charcoal and kerosine.

Table 18: Types of Helper as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Type of Helper									
	Older Children	Husband	House Maid	No Helper	Aunt	Other Relatives	House Maid and Husband	Older Children and Mother	Older Children and House Maid	Total
Well-nourished children	66.7 (22)	50.0 (1)	65.5 (19)	71.0 (76)	66.7 (2)	75.0 (15)	100.0 (1)	-	100.0 (2)	69.7 (138)
Mildly malnourished children	30.3 (10)	50.0 (1)	34.5 (10)	21.5 (23)	33.3 (1)	20.0 (4)	-	100.0 (1)	-	25.3 (50)
Severely malnourished children	3.0 (1)	-	-	7.5 (8)	-	5.0 (1)	-	-	-	5.0 (10)
Total	100.0 (33)	100.0 (2)	100.0 (29)	100.0 (107)	100.0 (3)	100.0 (20)	100.0 (1)	100.0 (1)	100.0 (2)	100.0 (198)

Keys: (): Numbers in brackets indicate frequencies of responses.

-: No responses

In the category where the mothers used charcoal as fuel, 66.7 percent of their children were well-nourished, 30.3 percent were mildly malnourished and 3.0 percent were severely malnourished. For mothers who used firewood as a source of fuel 23.1 percent of the children were mildly malnourished, 9.6 percent were severely malnourished and

67.3 percent were well-nourished. In the category of mothers who used firewood and kerosine as fuel, 20.0 percent of their children were mildly malnourished and 80.0 percent were well-nourished. For mothers who used firewood and charcoal as source of fuel, 7.1 percent of the children were mildly malnourished, 7.1 percent were severely malnourished and 85.8 percent were well-nourished (Refer to Appendix D1).

4.3.3.1.3 Distance to Source of Firewood

More than a half (73.5 percent) of the mothers collected firewood within less than 1 km from their homesteads, 19.9 percent collected firewood within a distance of 1-2 km and only 6.6 percent of the mothers collected firewood 3-4 km away.

In the category of the mothers whose source of firewood was within distance of less than 1 km, 72.7 percent of their children were well-nourished, 18.2 percent were mildly malnourished and 9.1 percent were severely malnourished. The mothers whose source of firewood was within 1-2 km, 66.6 percent of their children were well-nourished, 16.7 percent were mildly malnourished and the same percentage (16.7) were severely malnourished. For the mothers whose source of firewood was within 3-4 km, there were equal percentages (50.0) of mildly malnourished and well-nourished children (Appendix D2).

4.3.3.1.4 Family Food Production

Based on this study, 68.7 percent of the mothers produced food for the family themselves. Less than a half (31.3 percent) of the mothers did not produce food for their family. Among the mothers who produced food for their families, 71.5 percent of their children were well-nourished, 23.4 percent were mildly malnourished and 5.1 percent were severely malnourished. For mothers who did not produce food for their families, 65.6 percent of the children were well-nourished, 29.5 percent were mildly malnourished and 4.9 percent were severely malnourished (Refer to Appendix D 3).

4.3.3.1.5 The Way of Getting Food if Not Cultivated

Majority (98.4 percent) of the mothers who did not produce food for their families bought food. Only 1.6 percent of mothers in this category received food from their employers or their husbands' employers. In the category of mothers who bought food, 65.0 percent of their children were well-nourished, 30.0 percent were mildly malnourished and 5.0 percent were severely malnourished (Appendix D4).

4.3.3.1.6 Type of Help Available in Cultivation

Less than half (32.9 percent) of the mothers were assisted by their husbands in cultivation. Seventeen point eight (17.8) percent of the mothers cultivated

themselves without any help, 21.3 percent used hired labourers and 13.3 percent used hired agricultural machinery such as farm tractors. Eleven point one (11.1) percent of the mothers cultivated with ox-plough. A small number of mothers (0.7 percent) got help in cultivation from relatives.

In the category of mothers who were assisted by their husbands 75.6 percent of their children were well-nourished, 22.2 percent were mildly malnourished and 2.2 percent were severely malnourished. For the mothers who cultivated without any help, 60.0 percent of their children were well-nourished, 24.0 percent were mildly malnourished and 16.0 percent were severely malnourished. In the group of mothers who used hired labour, 79.3 percent of their children were well-nourished, 17.3 percent were mildly malnourished and 3.4 percent were severely malnourished.

For mothers who hired agricultural machinery in cultivation, 72.2 percent of their children were well-nourished and 27.8 percent were mildly malnourished. In the case of mothers who used oxen, 66.7 percent of their children were well-nourished and 33.3 percent were mildly malnourished. In the group of mothers who got assistance in cultivation from relatives, all the children were mildly malnourished (Refer to Appendix D5).

4.3.3.1.7 Methods of Rice or Maize Flour Preparation

From this study 88.7 percent of the mothers used milling machine in processing grains. Six point two (6.2) percent of the mothers were using mortar and pestle. Other mothers (5.1 percent) used a combination of mortar and pestle and milling machine.

In the category of mothers who used milling machine in processing grains, 69.9 percent of their children were well-nourished, 26.1 percent were mildly malnourished and 4.0 percent were severely malnourished. For the mothers who used mortar and pestle in processing grains, 50.0 percent of their children were well-nourished, 33.3 percent were mildly malnourished and 16.7 percent were severely malnourished. In the case of mothers who used a combination of mortar and pestle and machine, 80.0 percent of their children were well-nourished, 10.0 percent were mildly malnourished and 10.0 percent were severely malnourished (See Appendix D6).

4.3.3.1.8 Source of Water

It was found that 95.4 percent of the mothers got their water from taps, 2.6 percent from wells, 2.0 percent from streams. For the mothers who got water from the tap, 70.4 percent of the children were well-nourished, 25.4 percent were mildly malnourished and 4.2 percent were severely malnourished. In case of the mothers who got their water from wells, 80.0 percent of the children were

well-nourished and 20.0 percent were severely malnourished. Of the mothers who used streams as their source of water, 25.0 percent of the children were well-nourished, 50.0 percent were mildly malnourished and 25.0 percent were severely malnourished (Refer to Appendix D 7).

4.3.3.1.9 Availability of Food

(a) Cultivated Hectares:

The results from this study show that 62.1 percent of the mothers cultivated 2 - 3 hectares. Twenty six point seven (26.7) percent of the mothers cultivated less than one hectare. Six point seven (6.7) percent cultivated 4 - 5 hectares. Only four point five (4.5) percent of the mothers cultivated more than 5 hectares.

In the category of mothers who cultivated 2 - 3 hectares, 79.1 percent of their children were well-nourished, 18.6 percent were mildly malnourished and 2.3 percent were severely malnourished. For the mothers who cultivated less than one hectare, 52.8 percent of their children were well-nourished, 33.3 percent were mildly malnourished and 13.9 percent were severely malnourished. In case of mothers who cultivated 4-5 hectares, 77.8 percent of their children were well-nourished and 22.2 percent were mildly malnourished (See Appendix D8).

(b) Yield Harvested per Hectare

The results from this study showed that 33.6 percent of the mothers harvested 3-4 bags of maize per hectare, 24.0 percent harvested 5-6 bags per hectare, 19.0 percent harvested more than 10 bags per hectare, 7.3 percent harvested 7-8 bags per hectare, 14.6 percent harvested 1-2 bags perhectare and 1.5 percent harvested 9-10 bags per hectare.

In the category of mothers who harvested 1-2 bags per hectare, 35.0 percent of their children were mildly malnourished, 20.0 percent were severely malnourished and 45.0 percent were well-nourished. For the mothers who harvested 3-4 bags per hectare, 24.0 percent of their children were mildly malnourished, 4.3 percent were severely malnourished and 71.7 percent were well-nourished. Mothers who harvested 5 - 6 bags per hectare, 84.8 percent of their children were well-nourished and 15.2 percent were mildly malnourished. In case of the mothers who harvested more than 10 bags per hectare, 80.8 percent of their children were well-nourished, 15.4 percent were mildly malnourished and 3.8 percent were severely malnourished (Refer to Appendix D9).

4.3.3.2 Parity of the Mother

The results from this study showed that 34.6 percent of the mothers were having only one child. Of these, only child, 62.3 percent were well-nourished, 34.8 percent were

mildly malnourished and 2.9 percent were severely malnourished (Refer to Table 19).

Table 19: Parity of the Mother as Associated with malnourished and Well-nourished Children (percent)

Nutritional Status	Number of Children											
	One	Two	Three	Four	Five	Six	Seven	Eight	Ten	Eleven	Twelve	Total
Well-nourished children	62.3 (43)	77.3 (34)	58.1 (18)	85.0 (17)	57.1 (4)	81.8 (9)	-	87.5 (7)	100.0 (3)	100.0 (1)	100.0 (2)	69.7 (138)
Mildly malnourished children	34.8 (24)	20.5 (9)	32.3 (10)	15.0 (3)	28.6 (2)	9.1 (1)	-	12.5 (1)	-	-	-	25.3 (50)
Severely malnourished children	2.9 (2)	2.2 (1)	9.6 (3)	-	14.3 (1)	9.1 (1)	100.0 (2)	-	-	-	-	5.0 (10)
Total	100.0 (69)	100.0 (44)	100.0 (31)	100.0 (20)	100.0 (7)	100.0 (11)	100.0 (2)	100.0 (8)	100.0 (3)	100.0 (1)	100.0 (2)	100.0 (198)[a]

Keys: (): Numbers in brackets indicate frequencies of responses.

-: No responses

a: Total number of mothers in the sample.

4.3.3.2.1 Number of Family Members

The findings of this study showed that 21.2 percent of the mothers belonged to families of five members, 17.6 percent belonged to families of four members, 17.1 percent belonged to families of three members, 11.6 percent belonged to families of seven members and 9.0 percent belonged to families of six members as shown in Appendix D10.

In the category of mothers who belonged to families

of five members, 73.8 percent of their children were well-nourished, 21.4 percent were mildly malnourished and 4.8 percent were severely malnourished. In case of mothers who belonged to families of four members, 82.9 percent of their children were well-nourished and 17.1 percent were mildly malnourished. In the category of mothers who belonged to families of three members, 73.5 percent of the children were well nourished, 20.6 percent were mildly malnourished and 5.9 percent were severely malnourished (Appendix D10).

4.3.3.2.2 Number of Children Below Five Years

The majority (57.0 percent) of the mothers had only one child aged under five years. Less than a half (36.3 percent) of the mothers had two children. Five point seven (5.7) percent of the mothers had three children. Only 1.0 percent of the mothers had four children.

For the mothers who had only one child, 63.7 percent of the children were well-nourished, 30.1 percent were mildly malnourished and 6.2 percent were severely malnourished. In the category of mothers with three children, 81.8 percent were well-nourished, 18.2 percent were severely malnourished and for the mothers who had four children all of them were well-nourished (Refer to Table 20).

4.3.3.3 Mother's Age

The results showed that 33.9 percent of the mothers were aged between 21-26 years, 28.3 percent were aged between 15-20 years, 19.2 percent were aged between 27-32 years, 12.6 percent were aged between 33-38 years, 4.5 percent were aged between 39-44 years and only 1.5 percent of the mothers were aged between 45 - 50 years.

Table 20: Percentage of Children Below Five Years as Associated with Malnourished and Well-nourished Children

Nutritional Status	**Number of Children**				
	One	Two	Three	Four	Total
Well-nourished Children	63.7 (72)	76.4 (55)	81.8 (9)	100.0 (2)	69.7 (138)
Mildly malnourished Children	30.1 (34)	22.2 (16)	-	-	25.3 (50)
Severely malnourished Children	6.2 (7)	1.4 (1)	18.2 (2)	-	5.0 (10)
Total	**100.0 (113)**	**100.0 (72)**	**100.0 (11)**	**100.0 (2)**	**100.0 (198)[a]**

Keys: (): Numbers in brackets indicate frequencies of responses

- : No responses

a : Total number of mothers in the sample.

For the mothers aged between 21-26 years, 76.1 percent of their children were well-nourished, 20.9 percent were mildly malnourished and 3.0 percent were severely malnourished. The mothers between 15-20 years old, 62.5 percent of their children were well-nourished, 32.1 percent were mildly malnourished and 5.4 percent were severely malnourished. In the category of mothers between 27-32 years, 65.8 percent of their children were well-nourished, 26.3 percent were mildly malnourished and 7.9 percent were severely malnourished. The mothers who were between 33-38 years old, 68.0 percent of their children were well-nourished and 32.0 percent were mildly malnourished. In the case of mothers who were between 45 - 50 years, 33.3 percent of their children were well-nourished and 66.7 percent were severely malnourished (Table 21).

4.3.3.3.1 Mother's Age when Getting the First Child

The results from this study showed that 47.9 percent of the mothers had their first child when they were between 15-18 years old, 37.9 percent had their first child at the age of 19 - 22 years, 8.7 percent had their first child at the age of 23-26 years and 2.5 percent had their first child at the age of 27-30 years. The same percentage (2.5) of mothers had their first child when they were below 14 years. Only 0.5 percent of the mothers had their first child when they were 31 - 34 years.

Table 21: Mother's Age as Associated with Malnourished and Well-nourished Children (percent).

Nutritional Status	Mother's Age						
	15-20	21-26	27-32	33-38	39-44	45-50	Total
Well-nourished Children	62.5 (35)	76.1 (51)	65.8 (25)	68.0 (17)	100.0 (9)	33.3 (1)	69.7 (138)
Mildly malnourished Children	32.1 (18)	20.9 (14)	26.3 (10)	32.0 (8)	-	-	25.3 (50)
Severely malnourished Children	5.4 (3)	3.0 (2)	7.9 (3)	-	-	66.7 (2)	5.0 (10)
Total	**100.0 (56)**	**100.0 (67)**	**100.0 (38)**	**100.0 (25)**	**100.0 (9)**	**100.0 (3)**	**100.0 (198)[a]**

Keys: (): Numbers in brackets imply frequencies of responses

-: No responses

a: Total number of mothers in the sample.

In the category of mothers who had their first child at the age between 15 - 18 years, 66.3 percent of their children were well-nourished, 28.4 percent were mildly malnourished and 5.3 percent were severely malnourished. For the mothers who were between 19 - 22 years, 78.7

percent of their children were well-nourished, 18.7 percent were mildly malnourished and 2.6 percent were severely malnourished.

In the group of mothers who were between 23-26 years old, 47.1 percent of their children were well-nourished, 35.3 percent were mildly malnourished and 17.6 percent were severely malnourished. For the mothers who were 27-30 years old, 80.0 percent of their children were well-nourished and 20.0 percent were mildly malnourished. For the mothers who had their first child when they were below 14 years, 80.0 percent of their children were well-nourished and 20.0 percent were mildly malnourished (See Table 22).

Table 22: Age of the Mother when Getting the First Child as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Age of the Mother						
	Below 14	15-18	19-22	23-26	27-30	31-34	Total
Well-nourished Children	80.0 (4)	66.3 (63)	78.7 (59)	47.1 (8)	80.0 (4)	-	69.7 (138)
Mildly Malnourished Children	20.0 (1)	28.4 (27)	18.7 (14)	35.3 (6)	20.0 (1)	100.0 (1)	25.3 (50)
Severely Malnourished Children	-	5.3 (5)	2.6 (2)	17.6 (3)	-	-	5.0 (10)
Total	**100.0 (5)**	**100.0 (95)**	**100.0 (75)**	**100.0 (17)**	**100.0 (5)**	**100.0 (1)**	**100.0 (198)[a]**

Keys: (): Numbers in brackets imply frequencies of responses

- : No responses

a : Total number of mothers in the sample.

4.3.4 Relationship between Infection and Malnutrition

4.3.4.1 Types of Childhood Illnesses which Affected Children in the Past 3 Months Prior to the Research

This study showed that fever and malaria (56.8 percent) were very common diseases among children in Morogoro Urban. Diarrhoea was the second common disease (13.8 percent) then cough (8.5 percent) and vomiting (5.2 percent). Other diseases were: eye diseases (0.7 percent); fever, vomiting and diarrhoea (4.6 percent); pneumonia (2.6 percent); vomiting and diarrhoea (3.9 percent) and measles (3.9 percent). Among the children affected by fever and malaria, 71.3 percent were well-nourished, 19.5 percent were mildly malnourished and 9.2 percent were severely malnourished (Refer to Table 23).

4.3.4.2 Treatment of the Children from Illness

Majority (98.5 percent) of the mothers had their children treated in hospitals for various illnesses. Only 1.5 percent of the mothers had their children treated by traditional doctors. High percentage (70.8) of the children who were treated in hospitals were well-nourished while 24.1 percent were mildly malnourished and 5.1 percent were severely malnourished (Refer to Table 24).

Table 23: Childhood Illnesses as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Diseases									
	Fever and Malaria	Vomiting	Diarrhoea	Cough	Eye	Fever, vomiting and diarrhoea	Pneumonia	Vomiting and diarrhoea	Measles	Total
Well-nourished children	71.3 (62)	75.0 (6)	76.2 (16)	53.8 (7)	-	100.0 (7)	100.0 (4)	33.3 (2)	33.3 (2)	69.3 (106)
Mildly malnourished children	19.5 (17)	25.0 (2)	19.0 (4)	46.2 (6)	-	-	-	66.7 (4)	66.7 (4)	24.2 (37)
Severely malnourished children	9.2 (8)	-	4.8 (1)	-	100.0 (1)	-	-	-	-	6.5 (10)
Total	100.0 (87)	100.0 (8)	100.0 (21)	100.0 (13)	100.0 (1)	100.0 (7)	100.0 (4)	100.0 (6)	100.0 (6)	100.0 (153)[a]

Keys: (): Numbers in brackets indicate frequencies of responses.

-: No responses

a: Total number of children in the sample.

4.3.5 Relationship between Birth Weight, Child's Age and Immunization and Child Malnutrition

4.3.5.1 The Child's Age

The results showed that 31.8 percent of the children were aged between 0-6 months, 25.3 percent were aged between 7-12 months, 18.7 percent were aged between 13-18 months, 6.5 percent were aged between 19-24 months and

only 17.7 percent were aged above 24 months.

Table 24: Treatment of the Children from Illness as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	**Source of Treatment**		
	Hospital	Traditional Doctor	Total
Well-nourished Children	70.8 (138)	100.0 (3)	71.2 (141)
Mildly Malnourished Children	24.1 (47)	-	23.7 (47)
Severely Malnourished Children	5.1 (10)	-	5.1 (10)
Total	**100.0 (195)**	**100.0 (3)**	**100.0 (198)[a]**

Keys: (): Numbers in brackets indicate frequencies of responses.

- : No responses

a : Total number of children in the sample.

In the category of age group between 0-6 months, 77.8 percent of the children were well-nourished, 15.9 percent were mildly malnourished and 6.3 percent were severely malnourished. For children aged between 7-12 months, 74.0 percent were well-nourished and 26.0 percent were mildly

malnourished. Among the children who were aged between 13-18 months, 51.4 percent were well-nourished, 40.5 percent were mildly malnourished and 8.1 percent were severely malnourished. In case of the children aged between 19-24 months, 69.2 percent were well-nourished and 30.8 percent were mildly malnourished. In the age group of above 24 months, 68.6 percent were well-nourished, 22.9 percent were mildly malnourished and 8.5 percent were severely malnourished (Refer to Table 25).

4.3.5.2 Birth weight

More than a half (53.6 percent) of the mothers delivered their children with 3.0 kg birth weight, 32.0 percent delivered their children weighing 4.0 kg, 2.8 percent gave birth to children weighing 1.0 kg, 11.0 percent of the mothers delivered their children weighing 2.0 kg and only 0.6 percent delivered their children at 5.0 kg birth weight.

In the category of children born with birth weight of 4.0 kg, 74.1 percent were well-nourished, 20.7 percent were mildly malnourished and 5.2 percent were severely malnourished. For the children born with birth weight of 3.0 kg, 68.1 percent were well-nourished, 27.8 percent were mildly malnourished and 4.1 percent were severely malnourished. For the children born with 5.0 kg birth weight all of them were well-nourished (Table 26).

Table 25: Association of age with Malnourished and Well-nourished Children (percent)

Nutritional Status	Child's Age (Months)					
	0-6	7-12	13-18	19-24	Above 24	Total
Well-nourished Children	77.8 (49)	74.0 (37)	51.4 (19)	69.2 (9)	68.6 (24)	69.7 (138)
Mildly Malnourished Children	15.9 (10)	26.0 (13)	40.5 (15)	30.8 (4)	22.9 (8)	25.3 (50)
Severely Malnourished Children	6.3 (4)	-	8.1 (3)	-	8.5 (3)	5.0 (10)
Total	**100.0 (63)**	**100.0 (50)**	**100.0 (37)**	**100.0 (13)**	**100.0 (35)**	**100.0 (198)[a]**

Keys: (): Numbers in brackets mean frequencies of responses.

-: No responses

a: Total number of children in the sample.

Table 26: Birth weight (kg) as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Birth weight (kg)					
	1	2	3	4	5	Total
Well-nourished Children	80.0 (4)	55.0 (11)	68.1 (66)	74.1 (43)	100.0 (1)	69.0 (125)
Mildly Malnourished Children	20.0 (1)	35.0 (7)	27.8 (27)	20.7 (12)	-	26.0 (47)
Severely Malnourished Children	-	10.0 (2)	4.1 (4)	5.2 (3)	-	5.0 (9)
Total	**100.0 (5)**	**100.0 (20)**	**100.0 (97)**	**100.0 (58)**	**100.0 (1)**	**100.0 (181)[a]**

Keys: (): Numbers in brackets mean frequencies of responses.

-: No responses

a: Total number of children in the sample who were delivered in Hospitals so their birth weights are known.

4.3.5.3 Immunization

A high percentage (96.9) of the children were immunized against tuberculosis, polio, measles and

tetanus. Only 3.1 percent of the children were not immunized. Of those children who were immunized, 69.3 percent were well-nourished, 25.5 percent were mildly malnourished and 5.2 percent were severely malnourished. For those children who were not immunized 33.3 percent were well-nourished, 16.7 percent were mildly malnourished and 50.0 percent were severely malnourished (Refer to Table 27).

Table 27: Immunization as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	**I m m u n i z a t i o n**		
	Immunized	Not Immunized	Total
Well-nourished Children	69.3 (133)	33.3 (2)	68.2 (135)
Mildly malnourished Children	25.5 (49)	16.7 (1)	25.3 (50)
Severely malnourished Children	5.2 (10)	50.0 (3)	6.5 (13)
Total	**100.0 (192)**	**100.0 (6)**	**100.0 (198)[a]**

Keys: (): Numbers in brackets mean frequencies of responses.

a : Total number of mothers in the sample.

4.3.6 Relationship between Marital Status and Occupation of the Mother and Child Malnutrition

4.3.6.1 Marital Status

The results of this study showed that 76.8 percent of the mothers were married, 22.7 percent were unmarried and only 0.5 percent of the mothers were divorcees.

In the category of married mothers, 71.7 percent of the children were well-nourished, 24.3 percent were mildly malnourished and 4.0 percent were severely malnourished. For unmarried mothers, 62.2 percent of the children were well-nourished, 28.9 percent were mildly malnourished and 8.9 percent were severely malnourished. In the case of divorced mothers, the children were well-nourished (See Table 28).

4.3.6.2 Mothers' Occupation

In this study 42.1 percent of the mothers were farmers (peasants), 40.0 percent were unemployed mothers, 16.9 percent were employed and only 1.0 percent were involved in income generating activities.

All the children who belonged to mothers involved in income generating activities (business women) were well-nourished. In the category of mothers who were employed in private or public sector, 73.5 percent of the children were well-nourished and 26.5 percent were mildly malnourished. In the case of unemployed mothers, 69.6 percent of the children were well-nourished, 22.8 percent

were mildly malnourished and 7.6 percent were severely malnourished. For the mothers who were peasant farmers, 67.5 percent of their children were well-nourished, 27.7 percent were mildly malnourished and 4.8 percent were severely malnourished (Refer to Table 29).

Table 28: Marital Status as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	**Marital Status**			
Total	Unmarried	Married	Divorced	
Well-nourished Children	62.2 (28)	71.7 (109)	100.0 (1)	69.7 (138)
Mildly malnourished Children	28.9 (13)	24.3 (37)	-	25.3 (50)
Severely malnourished Children	8.9 (4)	4.0 (6)	-	5.0 (10)
Total	**100.0 (45)**	**100.0 (152)**	**100.0 (1)**	**100.0 (198)[a]**

Keys: (): Numbers in brackets mean frequencies of responses

-: No responses

a: Total number of mothers in the sample.

Table 29: Mothers' Occupation as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Mothers' Occupation				
	Farmer	Employed in private or public sector	Un-employed	Business	Total
Well-nourished Children	67.5 (56)	73.5 (25)	69.6 (55)	100.0 (2)	69.7 (138)
Mildly Malnourished Children	27.7 (23)	26.5 (9)	22.8 (18)	-	25.3 (50)
Severely Malnourished Children	4.8 (4)	-	7.6 (6)	-	5.0 (10)
Total	**100.0 (83)**	**100.0 (34)**	**100.0 (79)**	**100.0 (2)**	**100.0 (198)[a]**

Keys: (): Numbers in brackets indicate frequencies of responses.

-: No responses

a: Total number of mothers in the sample.

4.4 Selected Factors Associated with Malnourished and Well-nourished Children

Multiple regression analysis was carried out to determine the Correlation Coefficient of selected factors associated with malnourished and well-nourished children. Refer to Appendix E for the Correlation Coefficients of

some selected factors influencing nutritional status as expressed in weight-for-age. Path Coefficient Analysis was carried out to establish the ranking and correlations of the selected factors (Appendix F) and the selected factors are summarized in Table 30.

Table 30: Selected Factors Associated with Malnourished and Well-nourished Children

Number of Factors	Factors	Ranking Order	Path Coffi-cients	Corre-lation Coeffi-cients with depe-ndent variable
1.	Income: The money spent on food per month	1	0.180	0.0248
2.	Breast-feeding method	2	0.147	0.2416**
3.	Availability of food in terms of hectares cultivated	3	0.129	0.0121
4.	Birthweight	4	0.097	0.1084
5.	Mother's level of education	5	0.093	0.0637
6.	Commencement of breas-tfeeding after delivery	6	0.077	0.1335
7.	Workload of the mother: In terms of family food production	7	0.074	-0.0173
8.	Immunization	8	0.072	-0.0175
9.	Weaning period	9	0.059	-0.1135
10.	Mothers' age	10	0.048	-0.0192

11.	Infection and diseases: Duration of admission in hospitals for the sick children	11	0.041	-0.0684
12.	Level of income for the wage earning mothers	12	0.018	-0.0178
13.	Frequency of breast-feeding during day time	13	0.009	0.1982*
14.	Availability of food; the yield harvested in terms of bags per hectare	14	-0.019	0.0263
15.	Diseases/Infection in terms of admission or non-admitted	15	-0.040	-0.0684
16.	Parity of the mother	16	-0.051	-0.0495
17.	Bottle-feeding	17	-0.058	-0.0159
18.	Number of people in the household	18	-0.059	-0.0763
19.	Level of income: Income generating projects	19	-0.104	-0.0743
20.	Frequency of breast-feeding during night time	20	-0.125	0.1193
21.	Mother's age when she delivered her first child	21	-0.137	-0.0605
22.	Age of the child when stopped breast-feeding	22	-0.171	-0.2668**
23.	Feeding frequency of foods other than milk	23	-0.242	-0.2456**

Keys: * = Significant at P<0.010

** = Significant at P<0.001

Based on the Path Coefficient Analysis as shown in Table 30, the most important factor associated with child nutritional status is the level of income, that is the

money spent on food per month with a Path Coefficient of 0.18, followed by breast-feeding method with a Path Coefficient of 0.147; availability of food in terms of hectares cultivated with a Path Coefficient of 0.129; birth weight with a Path Coefficient of 0.097; mother's level of education with Path Coefficient of 0,093 commencement of breast-feeding after delivery with a Path Coefficient of 0.077; workload of the mother in terms of family food production with a Path Coefficient of 0.074; immunization with a Path Coefficient of 0.072; weaning period with a Path Coefficient of 0.059; mother's age with a Path Coefficient of 0.048; infection and diseases that is duration of admission in hospitals for the sick children with a Path Coefficient of 0.041.

Other factors include level of income for the wage earning mothers with a Path Coefficient of 0.018; frequency of breast-feeding during daytime with a Path Coefficient of 0.009; availability of food that is the yield harvested in terms of bags per hectare with a Path Coefficient of -0.019; disease/infection in terms of admission or non-admission with a Path Coefficient of -0.04; parity of the mother with a Path Coefficient of -.051; bottle-feeding with a Path Coefficient of -0.058; number of people in the household with a Path Coefficient of -0.059; level of income from generating projects with a Path Coefficient of -0.104; frequency of breast-feeding during night time with a Path Coefficient of -0.125;

mother's age when she delivered her first child with a Path Coefficient of -0.137; age of the child when stopped breast-feeding with a Path Coefficient of -0.171; finally, feeding frequency of foods other than milk with Path Coefficient of -0.242.

4.5 Comparison of the Factors Associated with Malnourished and Well-nourished Children

Several factors were identified to be associated with malnourished and well-nourished children in Morogoro urban. Path Coefficient Analysis was carried out to establish the direct and indirect effects of some selected factors associated with malnourished and well-nourished children. Direct effects are bolded diagonally while the rest are indirect effects (Appendix F). In this analysis the effects were either positively or negatively correlated among the factors. Few factors were found to be significantly associated with child nutritional status in this study.

The factors which were found to be significantly associated with well-nourished and malnourished children were as follows: breast-feeding method was positively significant at $P<0.001$; frequency of breast-feeding during the daytime was positively significant at $P<0.010$; age of the child when stopped breast-feeding was negatively significant at $P<0.001$ and feeding frequency of foods other than milk was negatively significant at $P<0.001$.

The rest of the factors were found to be non-significant as associated with malnourished and well-nourished children in Morogoro Urban (Refer to Appendix F) and Table 32.

CHAPTER V

INTERPRETATION AND DISCUSSION

5.1 Interpretation of Results

5.1.1 The Most Prevalent Forms of Malnutrition in Morogoro Urban

The most prevalent forms of malnutrition in Morogoro Urban seemed to be underweight followed by Kwashiorkor and Marasmus. Most (80.1 percent) of the children seemed to be underweight. The high percentage of underweight might be attributed to several factors such as: workload of the mother that leads to low feeding frequency; secondly, infections such as diarrhoea or malaria; and thirdly, the shortage of foods during the period (May-July) when the research was conducted. Kwashiorkor was found to be the second to underweight. This might be due to inadequate feeding especially of protein-rich foods.

5.1.2 The Rate of Underfive Children Suffering from Malnutrition

The rate of underfive children suffering from malnutrition in Morogoro Urban has been found to be 25.3 percent mildly malnourished and 5.1 percent severely malnourished. The total rate of malnutrition was 30.4 percent. Malnutrition rate as it is in Morogoro Urban is very high. Several factors may be attributed to the high rate of malnutrition as presented in Table 30, Chapter IV.

5.1.3 Factors Associated with Malnourished and Well-nourished Children in Morogoro Urban

5.1.3.1 Level of Income

More than a half (70.4 percent) of the well-nourished and 29.6 of the malnourished children belonged to mothers whose salaries were Tsh. 2,000 to Tsh. 5,000 per month. There were no malnutrition cases for mothers earning Tsh. 5,000 and above while all the children of mothers earning below Tsh. 2,000 per month were malnourished. The reason for the high percentage (70.4) of well-nourished children amongst mothers in the high income bracket might be that their mothers had enough money to buy weaning foods for them. For the malnourished children, their mothers might not be using the money they have earned to buy foods. The second reason might be that if the mother is an employee in a formal sector she might not have enough time to stay with her children. Hence, inadequate feeding frequency due to limited time for food preparation.

Mothers in the study were engaged in different income generating projects, which helped to raise their income level. These projects were: poultry keeping, pig and cattle raising, sewing and tailoring, beer brewing, pottery, sale of cooked foods, sale of vegetables and fruits, hair dressing, shop owners, sale of charcoal, sale of maize flour, carpentry and fishing. The income of these mothers varied from below Tsh. 2,000 to above Tsh. 5,000 per month. This study showed that mothers who earned

a high income had a high percentage of well-nourished children compared to the mothers who had a low income (below Tsh. 2,000 per month). The implication here is that the high income earners managed to buy adequate foods for their children and their family. While the low income earners might not afford to buy enough foods.

In the group of mothers earning Tsh. 5,000 and above, no case of severe malnutrition was observed. Seventy six point two (76.2) percent of their children were well-nourished and 23.8 percent were mildly malnourished. Among the mothers earning between Tsh. 2,000 to Tsh. 5,000, 2.5 percent of their children were severely malnourished, 19.5 were mildly malnourished and 78.0 percent were well-nourished. For mothers earning below Tsh. 2,000, 30.0 percent of their children were mildly malnourished.

The mothers' level of income is only one of the main factors contributing to malnutrition, other factors included feeding methods, inadequate feeding frequency and diseases.

5.1.3.2 Mothers' Level of Education

Mothers' education is a very important factor influencing the nutritional status of children. Most of the malnourished children (26.9 percent mildly malnourished and 7.7 percent severely malnourished) belonged to mothers with primary education (Std I-VII).

Also a relatively high malnutrition rate was found among children whose mothers did not go to school at all (26.8 percent were mildly malnourished and 7.3 percent were severely malnourished). The primary educated mothers or those mothers who did not go to school lack basic knowledge in nutrition. Also it may not be easy for them to understand what has been taught at MCH clinics in nutrition. Therefore, they may not be able to apply the knowledge easily hence they end up having high percentage of malnourished children.

The occurance of well-nourished children amongst mothers who had primary education and those who did not go to school may be explained in that firstly, mothers can learn from various sources, for example, from books, radio, newspapers, pamphlets and other written or published papers about nutrition. Secondly, through discussion and interactions with other mothers.

5.1.3.3 Beliefs and Taboos

Beliefs about foods were mainly religious-related especially for Muslims. Children who belonged to Muslim families were forbidden to eat pork. However, this did not appear to have a negative influence on child nutritional status. Taboos included: not feeding children with left-overs because they were going to feel uncomfortable; not feeding children with vegetables because they might have stomach discomfort; not breast-

feeding or feeding supplementary foods when the children were sick because it was not good for the child.

About 94.0 percent of the mothers surveyed breast-fed and fed their children with supplementary foods when they were sick. In the category of children who were breast-fed when they were sick 25.8 percent were mildly malnourished and 5.4 percent were severely malnourished.

In the category of children who were fed with supplementary foods when they were sick, 25.8 percent were mildly malnourished and 4.8 percent were severely malnourished. The cases of malnutrition among children who were breast-fed and who were fed with supplementary food when they were sick might be a result of other factors such as poor quality of weaning foods, inadequate feeding frequency and the effect of diseases.

5.1.3.4 Feeding Frequency

5.1.3.4.1 Feeding Frequency of Foods other than Milk

The majority of mothers (47.1 percent) and (30.5 percent) fed thier children 3 or 2 times per day. In the case of children who were fed 3 times per day, 25.0 percent of them were mildly malnourished and 2.3 percent were severely malnourished. Among children who were fed twice per day, 15.8 percent were mildly malnourished and 10.5 percent were severely malnourished. Only one case out of 29 of severe malnutrition was observed amongst those who were fed at the recommended feeding frequency

(4-6) times per day. The results showed that 44.0 percent mildly malnourished and 4.0 percent severely malnourished children were those fed 4 times per day. Also 75.0 percent of the mildly malnourished were those children who were fed more than 5 times per day. The presence of malnourished children amongst those who were fed at the recommended frequency (4 - 6) times per day might be attributed to inadequate quantity and poor quality of weaning foods.

5.1.3.4.2 Breast-feeding Frequency

The majority of mothers (50.8 percent) breast-fed their children on demand during the night. Also 65.9 percent of the mothers breast-fed their children on demand during the day time. In both categories there were high percentages of well-nourished children, that is, 70.5 percent amongst mothers who breast-fed on demand during the night and 67.0 percent amongst those who breast-fed on demand during the day time.

There were also fairly high percentages of malnourished children amongst mothers who were breast-feeding on demand during the night time (25.0 percent mildly malnourished and 4.5 percent severely malnourished) and amongst mothers who were breast-feeding on demand during the daytime (25.9 percent mildly malnourished and 7.1 percent severely malnourished). The fairly high percentages of malnutrition among children who were

breast- fed on demand might be attributed to being breast-fed only without supplementary foods even if the children have reached the weaning age.

Majority (85.9) percent of the mothers were breast-feeding and only 14.1 percent were not breast-feeding because their children were old enough. Amongst those children who were breast-fed, 72.4 percent were well-nourished, 23.5 percent were mildly malnourished and 4.1 percent were severely malnourished. The fairly high percentage of malnutrition amongst breast-fed children might be attributed to prolonged period of breast-feeding without giving supplementary foods even when they have reached the weaning age (4-6 months). Fifty seven point one (57.1) percent of the children who were not breast-fed were well-nourished, 35.7 percent were mildly malnourished and 7.2 percent were severely malnourished. As may be expected the presence of malnutrition amongst children who were not breast-fed might be due to low feeding frequency and hence inadequate energy intake.

5.1.3.5 Commencement of Breast-feeding after Delivery

It is very important to start breast-feeding immediately after delivery in order for the child to benefit from the first milk or colostrum. In this study it was found that all mothers started breast-feeding within the range of the production of colostrum, that is within 3 days. Starting breast-feeding immediately helps

to build a bond between the mother and the child. It also helps in stimulation of the flow of milk.

A low percentage (8.8) of mothers breast-fed their children after 24 hours of delivery and some of these were mothers who delivered by caesar. Also other mothers did not start to breast-feed immediately after delivery because they still believe that colostrum is not good for the child. These mothers believe that by breast-feeding children on colostrum, their children can easily get diarrhoea.

Amongst the children who were breast-fed immediately after delivery, 76.9 percent were well-nourished, 17.9 percent mildly malnourished and 5.2 percent severely malnourished. These malnutrition cases might be attributed to many factors. Sixty point three (60.3) percent of the well-nourished children were breast-fed within 1-3 hours after delivery, while 36.5 percent were mildly malnourished and 3.2 percent were severely malnourished. In this case, other factors such as early introduction of weaning foods, bottle-feeding, poor quality of weaning foods and infection might have contributed to malnutrition.

5.1.3.6 Age of Cessation of Breast-feeding

In this study there was only one child who stopped breast-feeding at the age of 2-6 months and he was mildly malnourished. The cause of malnutrition in this case

might be directly attributed to problems related to bottle- feeding. The mother was bottle-fed her child, as a result the child had repeated episodes of diarrhoea which finally resulted to malnutrition. The other reason might be that stopping breast-feeding abruptly when the child is still too young might result into loss of appetite and hence malnutrition. Among children who stopped breast-feeding at the age of 19-24 months, 61.5 percent were well-nourished, 23.1 percent were mildly malnourished and 15.4 percent were severely malnourished. Amongst children who stopped breast-feeding at the age above 24 months, a relatively high percentage (75.0) were well-nourished, 25.0 percent were mildly malnourished and no case of severe malnutrition was recorded.

The relatively high percentages of well-nourished children amongst those who stopped breast-feeding between 19-24 months and above 24 month might be attributed to their getting adequate nutrients from breast milk and in addition they might have been provided with enough supplementary foods. In the case of malnourished children the reason might be due to prolonged breast-feeding without supplementary foods and low feeding frequency and/or infections.

5.1.3.7 Ways the Child was Stopped from Breast-feeding

The findings of this study have indicated that, there was malnutrition among children irrespective of whether

they were stopped breast-feeding abruptly or gradually. Most of the mothers (82.2 percent) stopped breast-feeding their children abruptly. Among mothers who stopped breast- feeding their children abruptly, 26.1 percent were mildly malnourished.

Among mothers who stopped breast-feeding their children gradually 40.0 percent (2 cases out of 5) of their children were mildly malnourished. Cases of severe malnourished children (8.7 percent) were observed among children who were stopped breast-feeding abruptly. The difference in malnutrition rate between the two methods of stopping breast-feeding, that is abruptly and gradually; might be explained in that the former method may cause the child to lose appetite because of the sudden change in the diet.

5.1.3.8 Treatment of Bottles after Feeding

Thirty five point two (35.2) percent of the mothers washed feeding bottles with cold water and soap without boiling. In this category 50.0 percent of their children were well-nourished and 50.0 percent were mildly malnourished. The high percentage of malnourished children might be attributed to the unhygienic treatment of bottles which often results into the growth of bacteria which leads to diarrhoea hence malnutrition.

Twenty nine point five (29.5) percent of mothers washed their feeding bottles with water followed by

boiling. In this group there was a high percentage (80.0) of well-nourished children and a relatively low percentage (20.0) of mildly malnourished children. The high percentage of well-nourished children in this category might be due to the cleanness and hygienic handling of feeding bottles preventing gastroenteritis problems in children.

The results also indicated that 60.0 percent (3 out of 5) of the children of mothers who were washing their feeding bottles with soap followed by boiling were mildly malnourished. This showed that despite hygienic treatment of feeding bottles, malnutrition still occured in certain cases. This situation might be attributed to other factors such as low feeding frequency and overdiluted formula.

5.1.3.9 The Use of Bottle-feeding

More than half (70.2 percent) of the well-nourished children were not bottle-fed while 24.3 percent were mildly malnourished and 5.5 percent were severely malnourished. The high rate of well-nourished children who were not bottle-fed is a clear indication that bottle-feeding is not a suitable method of feeding because it is difficult to maintain hygienic handling and treatment of feeding bottles. In the case of the fairly high rate of malnourished children who were not bottle-fed, it might be attributed to other factors such as low feeding frequency

and prolonged breast-feeding without supplementation.

5.1.3.10 Types of Weaning Foods

Several types of food mixtures were used by mothers as weaning foods. The most common weaning food mixtures were maize flour porridge with water (18.3 percent); maize flour mixed with groundnut flour porridge (27.1 percent); and maize flour mixed with groundnut flour, small fish or "dagaa" flour and bean flour porridge (18.8 percent).

Among children who used maize flour porridge with water, 17.6 percent were mildly malnourished and 11.8 percent were severely malnourished. The main reason for the high percentage of malnourished children who used this mixture of only maize flour and water porridge, might be due to inadequate supply of nutrients in such a mixture.

The results showed that in the group of children who were fed on maize flour and groundnut flour porridge, 25.5 percent were mildly malnourished, 3.9 percent severely malnourished and 70.6 percent well-nourished children. Also in the group of children who were fed on maize flour mixed with groundnut flour, small fish or "dagaa" flour and beans flour porridge, 74.3 percent were well-nourished and 25.7 percent mildly malnourished. In these two categories the weaning food mixtures used are considered to have adequate nutrients although the observed malnutrition percentages are fairly high. The implication here is that for the well-nourished children, they might

be getting adequate food. As for the malnourished children it might be a result of low feeding frequency; infection and inadequate quantity of weaning foods.

Most of the mothers had no knowledge of using "power flour," oil and fat for reduction of bulkiness of weaning foods, as such most of the weaning foods were found to be too bulky. This means that the child could take only a small amount of food at one feeding. Therefore, in cases where children were not fed at the recommended frequency malnutrition was inevitable.

5.1.3.11 Weaning Period

Amongst children who were weaned at 2-3 months of age, 24.5 percent were mildly malnourished and 2.1 percent severely malnourished. The high percentage of malnourished children might be attributed to early weaning due to poor digestibility of starchy food at this age that leads to diarrhoea and hence malnutrition.

In the group of children who were weaned at 4-6 month, 65.9 percent were well-nourished children, 25.9 percent were mildly malnourished and 8.2 percent were severely malnourished. Weaning at the age of 4-6 months is the recommended practice although a high level of malnutrition was observed in this group. The implication of this finding is that the malnourished children might not have been fed adequately both in quality and quantity. One child who was weaned at the age 7-9 months was

severely malnourished. The cause of malnutrition in this case might be prolonged breast feeding without supplementary foods.

5.1.3.12 Workload of the Mother

5.1.3.12.1 Type of Helper in Performing Household Work

The majority (53.9 percent) of the mothers had no helper. In this category 21.5 percent of the children were mildly malnourished, 7.5 percent severely malnourished and 71.0 percent well-nourished. The cause of malnutrition might include, mother's limited time for caring their children which might have led to low feeding frequency, inadequate quantity and poorly prepared weaning foods. In the case of the well-nourished children, the mothers might have been able to prepare adequate meals for them in spite of their heavy workload.

Forty six point one (46.1) percent of the mothers were assisted in performing household work. The findings of this study have indicated that among mothers who were assisted by house-maids, 34.5 percent of their children were mildly malnourished, those mothers who were assisted by older children 30.3 percent of their children were malnourished and among mothers who were assisted by aunts 33.3 (1 out of 3) percent were mildly malnourished.

Though it is desirable to reduce the mother's workload, it is also clear that engaging helper in performing household tasks did not reduce malnutrition

rate. The possibility of helpers eating food intended for the children cannot be ruled out.

5.1.3.12.2 Types of Fuel Used

A high percentage of malnourished children (that is 23.1 mildly malnourished and 9.6 percent severely malnourished) belonged to the mothers who used only firewood as a type of fuel which implied that they spent a considerable amount of time collecting firewood. This in turn might have affected the time available for meal preparation. Thus, the high rate of malnutrition might be attributed to low feeding frequency.

5.1.3.12.3 Distance to Source of Firewood

There was high percentage (72.7) of well-nourished children amongst mothers who collected firewood within a distance of less than 1 km. Amongst mothers who collected firewood from a distance of 1-2 km, 66.6 percent of their children were well-nourished. For mother collecting firewood from a distance of 3-4 km, only 50.0 percent (1 out of 2) of their children was well-nourished. As the distance to the source of firewood increased the workload of the mothers also increased and this could have resulted to high rate of malnutrion due to low feeding frequency.

5.1.3.12.4 Family Food Production

In the category of mothers who produced family food

themselves, 71.5 percent of their children were well-nourished, 23.4 percent mildly malnourished and 5.1 percent were severely malnourished. The implication here is that family who produced food themselves that mothers might have produced adequate amount of food for consumption, therefore, they had a high rate of well-nourished children. In the case of mothers who produced the family food and had malnourished children there was inadequate food available to the family. Also malnutrition may have resulted because the mothers were too busy in cultivation so inadequate feeding frequency. For mothers who did not produce family food themselves, 65.6 of their children were well-nourished, 29.5 percent were mildly malnourished and 4.9 percent were severely malnourished. The reason for mothers who did not produce family food themselves to have well-nourished children might be that their mothers had adequate income to buy food for the family. While the reason for those who had malnourished children might be low level of mothers' income, therefore, inadequate food.

5.1.3.12.5 The Way of Getting Food if Not Cultivated

Mothers who did not produce the family food themselves, got the food from the employer or the food was bought. The majority (98.4 percent) of the mothers bought the family food while 1.6 percent got food from the employer.

A relatively high percentage (30.0) of mildly malnourished children and 5.0 percent of severely malnourished belonged to mothers who bought the family food. Sixty five (65.0) percent of the children of mothers who did not produce family food themselves were well-nourished indicating that their mothers had adequate income to buy the food. For the malnourished children, their mothers had inadequate income to buy the family food, hence inadequate feeding frequency among underfives.

5.1.3.12.6 Type of Help Available in Cultivation

Seventeen point eight (17.8) percent of mothers had no help in cultivation. Among mothers who had no help in cultivation of family food, 24.0 percent of their children were mildly malnourished and 16.0 percent were severely malnourished. Mothers who were helped in cultivation their husbands (32.9 percent) had 22.2 percent of their children malnourished and 2.2 percent of severely malnourished. The cause for malnutrition might be inadequate feeding frequency as the mothers were too busy in cultivation.

Seventeen point eight (17.8) percent of mothers had no help in cultivation. Among mothers who had no help in cultivation of family food, 24.0 percent of the children were mildly malnourished and 16.0 percent were severely malnourished. Twenty one point three (21.3) percent of mothers used hired labour. Inspite of the availabilty of

hired labour these mothers had malnourished children (that is, 17.3 percent were mildly malnourished and 3.4 percent were severely malnourished. Although the mothers had the help of hired labourers, they had to supervise them and this might have contributed to inadequate feeding frequency.

Mothers who used farm tractors (machinery) in farming also had a faily high percentage (27.8) of mildly malnourished children. The mothers who used oxen in cultivation, had a higher percentage (33.3) of mildly malnourished. One of the reasons for the high percentage of malnourished children among mothers engaged in cultivation with the help of labour saving technologies may be that the workload may not have been reduced adequately, therefore, they had little time to attend to their children's needs including meal preparation.

5.1.3.12.7 Methods of Rice or Maize Flour Preparation

Sixty nine point nine (69.9) percent of the well-nourished children, 26.1 percent of the mildly malnourished and 4.0 percent of the severely malnourished children belonged to mothers who used milling machine in flour preparation. The reason for the high percentage of well-nourished children among mothers who used milling machine for grain processing might be attributed to more time being available to mothers to pay adequate attention to their children. Hence the children received good care

and adequate feeding frequency. The implication of the presence of malnourished children amongst these mothers might be poor quality and low quantity of weaning foods.

Thirty three point three (33.3) percent of the mildly malnourished and 16.7 percent of the severely malnourished children belonged to mothers who used mortar and pestle in flour preparation. One of the causes of malnutrition might be that those mothers spent a lot of time in flour preparation. This reason also applies to those mothers who used a combination of both mortar and pestle and milling machine in flour preparation.

5.1.3.12.8 Source of Water

More than a half (70.4 percent) of the well-nourished, 25.4 percent of the mildly malnourished and 4.2 percent of the severely malnourished children belonged to mothers who fetched water from the water tap. The high percentage of well-nourished children amongst mothers who had access to tap water might be that their mothers had adequate time to look after their children since they did not have to walk long distance to fetch water. Hence, adequate feeding frequency. The presence of malnourished children amongst these mothers might be attributed to inadequate time available to take care of their children's needs due to other activities such as collection of firewood and cultivation. Therefore, inadequate feeding frequency.

A low percentage (2.6) of the mothers got water from wells. In this case, 20.0 percent of the children were severely malnourished. The rest of the mothers (2.0 percent) got water from streams. In this category, 50.0 percent of the children were mildly malnourished and 25.0 percent were severely malnourished. Only 25.0 percent of the children were well-nourished. The cause of malnutrition amongst children whose mothers did not have access to piped water might be due to infection and diseases and heavy workload of the mother.

5.1.3.12.9 Cultivated Hectares

The findings of this study have indicated that mothers who cultivated less than one hectare had a higher rate of malnourished children. That is, 33.3 percent mildly malnourished and 13.9 percent severely malnourished children belonged to mothers who cultivated less than one hectare. Eighteen point nine (18.9) percent of the mildly malnourished and 2.4 percent of the severely malnourished children belonged to mothers who cultivated 2-3 hectares. The presence of malnourished children amongst mothers who cultivated low hectareage and/or those who got low yields may be attributed to inadequate food available to the family. Hence malnutrition among the underfives. The other reason might be that the mothers tend to sell harvested yields without considering the amount of food which would be required for the whole season.

The presence of malnourished children among mothers who cultivated large hectareage might be that they were too busy in farming to attend to their children's need including meals preparation. As a result there was inadequate feeding frequency hence malnutrition. Also the possibility of such mothers selling their produce cannot be ruled out. Fifteen point two (15.2) percent of the malnourished children belonged to mothers who harvested 5-6 bags per hectare. Also 35.0 percent of the mildly malnourished children and 20.0 percent of the severely malnourished belonged to mothers who harvested 1-2 bags per hectare. The cause of malnutrition might be inadequate food available to the family.

5.1.3.13 Parity of the Mother

A high percentage of malnourished children belonged to the mothers having one to six children. There were no malnutrition cases among the children whose mothers had ten to twelve children. The malnutrition cases among mothers have one to six children might be attributed to heavy workload of the mother, low income and hence inadequate feeding frequency. The absence of malnutrition cases amongst mothers having ten to twelve children might be explained by the fact that older siblings these families helped to take care of the young. Meanwhile older children might be working and contributing to the family income.

5.1.3.14 Number of Family Members

Higher percentage of well-nourished children was found amongst small families (three to five members). Also a high percentage of well-nourished children was found in large families (nine to twenty one members). Medium size families (six to eight) had a relatively low percentage of well-nourished children. The reason of the high percentage of well-nourished children in small families might be attributed to adequate food available to the family. While a low percentage of well-nourished children in medium size families might be attributed to inadequate food. A high percentage of well-nourished children in large families might be that in these families there were older children or relatives who took care of the young children, so adequate feeding frequency. Also higher percentage of malnourished children were found amongst small families compared to large families. This might be due to heavy workload of the mother, hence low feeding frequency.

5.1.3.15 Number of Children Below Five Years

There was a high percentage of malnourished children (30.1 percent mildly malnourished and 6.2 percent severely malnourished) who belonged to mothers having only one child below five years old. The high malnutrition rate might be attributed to those mothers who were too young and lacking confidence, knowledge and/or experience in

caring for their children. The second reason might be due to the heavy workload of the mother hence inadequate feeding frequency.

5.1.3.16 Mother's Age

The findings of this study have indicated that young mothers were the majority. In this case 28.3 percent were between 15-20 years old, while 33.9 percent were between 21-26 years old. A high percentage of malnourished children belonged to young mothers. Among mothers aged between 15-20 years, 32.1 percent of their children were mildly malnourished and 5.4 percent were severely malnourished. Among mothers aged 21-26 years 20.9 percent of their children were mildly malnourished and 3.0 percent were severely malnourished. The reasons might be phycological, lacking confidence and experience in caring for their children. Also heavy workload of the mother and low income might have contributed to malnutrition cases. For the well-nourished children the reason might be that their mothers had adequate food and enough time to care for their children. Also these mothers had helpers hence adequate care for the children.

5.1.3.17 Mother's Age when Getting the First Child

Amongst the children who were delivered by the mothers when they were between 15-18 years old, 66.3 percent were well-nourished, 28.4 percent were mildly

malnourished and 5.3 percent were severely malnourished. While 78.7 percent of the well-nourished children, 18.7 percent of the mildly malnourished and 2.6 percent of the severely malnourished belonged to mothers who got their first child at the age of between 19-22 years old. The fairly high rate of malnourished children among mothers in these age groups might be that the mothers were too young and in experienced to take care of the children, hence malnutrition. For the well-nourished children the reason might be attributed to the presence of older relatives in the family who help to take care of the children.

5.1.3.18 Types of Childhood Illness which Affected Children in the Past 3 Months Prior to the Research

Majority of the children (56.8) percent had suffered from fever and malaria within a period of three months prior to commencement of this study. Among these children, 19.5 percent were mildly malnourished and 9.2 percent were severely malnourished. The high percentage of malnourished children might be attributed to infection and diseases. Sick children tend to lose appetite hence malnutrition.

5.1.3.19 Treatment of the Children from Illness

Most of the mothers (98.5 percent) took their children to hospitals for treatment. Among those children

treated in the hospitals, 70.8 percent were well-nourished while 24.1 percent were mildly malnourished and 5.1 percent severely malnourished. The reason for the presence of malnourished children among mothers who took their children to hospital for treatment might be due to other factors such as inadequate feeding frequency. While for the well-nourished children, it might be that those children were not seriously affected by illness and they were getting adequate feeding.

5.1.3.20 The Child's Age

Amongst children who were 0-6 month old, 77.8 percent were well-nourished, 15.9 percent mildly malnourished and 6.3 percent severely malnourished. The reason for the high percentage of well-nourished children in this age group might be attributed to adequate frequencies of breast- feeding and supplementary feeding. The fairly high rate malnourished children might be attributed to early weaning, bottle-feeding and inadequate frequencies of breast feeding and supplementary foods. A high percentage (26.0) of the mildly malnourished children were found in the 7-12 month old category. The reason for the presence of malnourished children in this age group might be of inadequate feeding frequency and prolonged breast-feeding without supplementary foods. For the well-nourished children, the cause might be attributed to good quality and quantity of weaning foods and adequate feeding

frequency.

Amongst children aged between 13-18 months, 40.5 percent were mildly malnourished and 8.1 percent severely malnourished. The interpretation of the finding as far as malnourished children are concerned might be low quality and quantity of weaning foods, late introduction of weaning foods and inadequate feeding frequency. Also a high percentage (22.9) of the mildly malnourished children and 8.5 percent of the severely malnourished children were aged above 24 months while 68.6 percent were well-nourished. The presence of malnourished children in this age group might be low feeding frequency. Well-nourished children were definitely getting enough food and adequate feeding frequency.

5.1.3.21 Birth weight

Sixty eight point one (68.1) percent of the well-nourished children, 27.8 percent of the mildly malnourished and 4.1 percent of the severely malnourished were born with 3.0 kg birth weight. While 74.1 percent of the well-nourished children, 20.7 percent of the mildly malnourished and 5.2 percent of the severely malnourished had birth weights of 4.0 kg.

The high rate of well-nourished children might be due to the good birth weight, while for the malnourished children the reasons might be due prolonged breast-feeding withouth supplementation. A low percentage (2.8) were

born with a birth weight of 1.0 kg and 11.0 percent were born weighing 2.0 kg. In the case of low birth weight, the child takes longer period to reach the exact weight-for-age, and might be easily infected.

5.1.3.22 Immunization

There was a high percentage (96.9) of immunized children against tuberculosis, polio, tetanus and measles. This indicates that most of the mothers in Morogoro Urban took their children to the MCH clinics for immunization. Only 3.1 percent of the children were not immunized. The reason may be that these children were only two weeks old at the time of interview. Among the children who were immunized, 69.3 percent were well-nourished, 25.5. were mildly malnourished and 5.2 percent were severely malnourished. The presence of malnourished children amongst those who were immunized might be attributed to factors such as inadequate feeding frequency, poor quality of weaning food and inadequate quantity.

5.1.3.23 Marital Status

More than half (71.7) percent of the well-nourished children, 24.3 percent of the mildly malnourished and 4.0 percent of the severely malnourished belonged to married mothers. The presence of well-nourished children, amongst married mothers is an indication that they were well cared for and got adequate food. Whereas the case of

malnourished children might be attributed to inadequate food and heavy workload of the mothers therefore low feeding frequency. A relatively high percentage (62.2) of the well-nourished children, 28.9 percent of the mildly malnourished and 8.9 of the percent severely malnourished belonged to unmarried mothers. The interpretation of this finding may be that unmarried mothers have heavy workload, low income and hence inadequate feeding frequency.

5.1.3.24 Mothers' Occupation

Amongst children whose mothers were farmers, 67.5 percent were well-nourished, 27.7 percent mildly malnourished and 4.8 percent severely malnourished. The malnourished children, might be getting inadequate food because their mothers were too busy cultivating that they did not have enough time to care of their children. Also these mothers might be having low income so they could not afford to buy essential food items.

A high percentage (22.8 mildly malnourished children and 7.6 percent severely malnourished) belonged to unemployed mothers. Most of these mothers did not go to school or were primary school leavers therefore they had inadequate knowledge about nutrition including appropriate weaning foods. Also the fact that they were not employed is a definite reflection of very low income.

There was no case of severe malnutrion among children

of mothers who were employed and of those who were engaged in income generating projects. The employed mothers were educated and had relatively high income to support their children. In the case of mothers who were engaged in business, they had income and were able to buy enough food for their children. Also these mothers might have house-maids to assist in taking care of the young children at home. In this category there was a high percentage of well-nourished children.

5.1.4 Effect of Selected Variables on Child Nutritional Status

Twenty three selected variables were subjected to both multiple regression and Path Coefficient analyses. In both analyses, weight-for-age was used as the dependent variable. Whereas the former analysis gave indication in the manner by which the independent variables were related to the dependent variable, the degree of mutual association among the independent variables was also evaluated by this analysis. On the other hand, the Path Coefficient analysis provided a means of ranking the independent variables on their direct influence (direct effect) on the dependent variable which was nutritional status expressed in terms of weight-for-age. In addition, the indirect effects or contributions of all the variables on the overall correlation were calculated. Both the direct and indirect effects of the 23 variables are shown

in Table 30 (Chapter IV). The independent variables which were significant at P<0.001 and 0.010 are marked by the symbols ** and * respectively as shown in (Appendix E). The variable which had overall significant effect on the nutritional status are summarized in Table 31.

Table 31: Independent Variables which are Significant at P<0.001 and 0.010.

Independent Varibale	Path Coefficient	Correlation Coefficient with Dependant variable (Weight-for-Age)
Breast-feeding method	0.147	0.2416**
Frequency of breast-feeding during daytime	0.009	0.1982*
Age of the child when stopped breast-feeding	-0.171	-0.2668**
Feeding frequency of foods other than milk	-0.242	-0.2456**

Keys: * ..... Significant at P < 0.010
** ..... Significant at P < 0.001

The nutritional status was positively and significantly correlated with the breast-feeding method and frequency of breast-feeding during daytime. The implication of breast-feeding method as positively significant as it relates to child nutritional status

might be that a high percentage (85.9) of the mothers were breast-feeding their children. The children were getting adequate nutrients for growth. Hence higher percentage (61.5) of well-nourished children. Frequency of breast-feeding during day time as positively significant as related to child nutritional status because most (65.9 percent) of the mothers were breast-feeding their children on demand. Therefore the children were getting adequate nutrients for growth.

On the other hand, children who were breast-fed to advanced ages and those who were fed less frequently with foods other than milk had reduced nutritional status as suggested by the significant negative correlations of -0.2668 and -0.2456 respectively ($P<0.001$). It is probable that the former category had reduced nutritional status due to delayed introduction of other foods to supplement breast- milk. While the latter had reduced nutritional status due to inadequate feeding frequency. Most of the children were fed 2-3 times per day, which is inadequate feeding frequency to supply adequate nutrients for the growth of the child. The recommended feeding frequency is 4-6 times per day.

The positively or negatively significant and non-significant nature of variables was due to how the indirect or direct variables were associated. If most of the indirect effects or the direct effects are reduced or positively correlated affects the total correlation

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The positively or negatively significant and non-significant nature of variables was due to how the indirect or direct variables were associated. If most of the indirect effects or the direct effects are reduced or positively correlated affects the total correlation

coefficient of a particular variable (Appendix F). For example breast-feeding method was positively significant at $P < 0.001$ as related to child nutritional status. This nature was attributed to highly positively correlated variable that is its own direct effect, age of the child when stopped breast-feeding; feeding frequency of foods other than milk; commencement of breast-feeding and birth weight (Appendix E). On the other hand, variables such as income that is money spent on food per month, in spite of being highly directly associated with child nutritional status proved to be non-significant. This condition was due to more reduced correlation effects of direct and indirect variables which resulted to a non-significant condition with a low (0.02480 total) correlation coefficient (Appendix E). Non-significant variables (Table 32) although are directly associated with nutrition status, there is a mutual correlation of variables to each other as they contribute to child nutritional status. For example, level of income and level of education correlate to each other in their association to nutritional status. That is, low educated mothers are the ones with low income hence higher percentage of malnourished children.

Table 32: Independent Variables which are Non-Significant at P<0.001 and 0.010

Variables	Path Coefficients	Correlation coefficients with Dependent Variable
Income: The money spent on food per month	0.18	0.0248
Availability of food in terms of hectare cultivated	0.129	0.0121
Birth weight	0.097	0.1084
Mother's level of education	0.093	0.0637
Commencement of breast-feeding after delivery	0.077	0.1335
Work load of the mother: In terms of family food production	0.074	-0.0173
Immunization	0.072	-0.0175
Weaning period	0.059	-0.1135
Mothers age	0.048	-0.0192
Infection and diseases: Duration of admission in hospitals for the sick children	0.041	-0.0684
Level of income for the wage earning mothers	0.018	-0.0178
Availability of food; the yield harvested in terms of bags per hectare	-0.019	0.0263
Diseases/Infection in terms of admission or non-admission	-0.004	-0.0684
Parity of the mother	-0.051	-0.0495
Bottle-feeding	-0.058	-0.0159

Number of people in the household	-0.059	-0.0763
Level of income: Income generating projects	-0.104	-0.0743
Frequency of breast-feeding during night time	-0.125	0.1193
Mother's age when she delivered her first child	-0.137	-0.0605

These variables depend upon each other and there is no evidence that each of those (alone) has an influence on "nutritional status" (directly or indirectly) (Rodrigo and Adams 1972).

5.2 Discussion of the Results

The extreme forms of PEM were found to be underweight followed by Kwashiorkor and Marasmus. These results correlate with the findings of Jonsson (1986) and Missappe (1988). Wood et al (1984) pointed out that underweight affects up to 30 percent of all children between 1 to 3 years of age. According to this study, underweight was found to be 80.1 percent followed by Kwashiorkor (10.2 percent) and Marasmus (9.1 percent) of all children between 0 months to 3 years of age. Due to fluctuations of food availability the findings showed that there was a higher percentage of underweight children in the month of May (37.6 percent) compared to June (30.8 percent) and July (31.6 percent). Harvesting of most food crops such as maize, rice and beans is done in June to July, this has

led to low percentage of underweight during this period. The high percentage of underweight in the month of May also may be due to diseases such as diarrhoea. The month of May being a rainy season, there was a higher probability of drinking dirty water, hence diarrhoea resulting in increased underweight. Generally heavy workload of the mother also may have contributed to underweight.

The rate of underfive children suffering from malnutrition in Morogoro Urban has been found to be 25.3 percent mildly malnourished and 5.1 percent severely malnourished. These results are in agreement with results of studies done by (TFNC 1984; 1987; Jonsson 1986; Keregero and Keregero 1987 and Kingamkono 1987) that proportionately the severe forms of malnutrition contribute to about 5-9 percent of malnutrition in the child population and that the moderate forms contribute about 40-60 percent in children below the age of five years. In this study the moderate forms of malnutrition contributed to 25.3 percent in children below the age of five years. Malnutrition rate in Morogoro Urban is high due to several factors such as low level of income, inadequate feeding frequency, diseases and heavy workload of the mother.

It was found from this study that the rate of malnutrition is related to the income level of the household. The big salary earners had low rate of

malnourished children compared to small salary earners. This is also true for the income derived from income generating projects. The mothers having high level of income had low rate of malnourished children compared to the mothers having low level of income. These findings are similar with the findings of Mohmoud (1983); Mgaza and Bantje (1980); Kazema (1982); Francois et al (1982); FAO (1980) and Lyimo (1989). For the low income earners, money is not enough to buy supplementary foods.

Mother's level of education was a very important factor also associated with nutritional status of the children. High percentage of malnourished children belonged to mothers who did not go to school and those who were primary school leavers. There were no cases of malnutrition among university educated mothers. This is also true with the findings of WHO (1982); Seenappa (1987); TFNC (1988); Gadiel (1986); Missappe (1988); Bonaventure (1989) and Ryan et al (1988). Low educated mothers or mothers who did not go to school lack knowledge on how to prepare nutritious foods for their children.

With regard to beliefs and taboos as they applied to this study, it was found that most of them were related to Muslims who did not eat pork due to religious reason. However, this is not a problem since other protein-rich foods besides pork are available and can be used. The other beliefs and taboos were on whether or not to feed or breast-feed the child when sick. This is a serious

situation because when a child is sick it needs more nutrients in order to recover fast. So there is a need to feed or breast-feed the child more frequently when sick.

Feeding frequency is still a problem in Morogoro Urban. Most of the children were fed 2-3 times per day. This feeding frequency is inadequate, the recommended feeding frequency is 4-6 times a day. These findings of low feeding frequency (2-3 times per day) are in agreement with the findings of Jonsson (1986); UNICEF (1987) and Mascarenhas (1983).

Majority of the mothers started breast-feeding immediately after delivery. This was very important as all children received first milk "colostrum" which is very important for the supply of nutrients and antibodies for immunity to the child especially for the first 6 months of life.

Most of the mothers breast-fed their children up to the age of 19-24 months and above 24 months and this result is in agreement with findings of Mrisho (1985). Also these findings show that most of the mothers followed Kavishe's (1984) recommendation that children have to be breast-fed up to 18-24 months of age. However these findings differ from those reported by Yohani (1981) that in urban areas most children are shifted from breast-feeding to bottle-feeding when they are young.

The results showed that most children were stopped breast-feeding abruptly and this is in disagreement with

a recommendation by Mgaza (1980) that young children should be stopped from breast-feeding gradually in order to minimize negative effects. Various reasons for weaning- off the breast were found to be similar to those pointed out by Yohani (1981). Reasons for weaning the child off the breast included: mothers were pregnant, the child refused the breast, milk was not enough and the child was old enough. The same methods for weaning-off the breast as pointed out by Yohani (1981) were identified in this study. The most common were the application of unpleasant tasting-substance on the breasts and covering the breasts with plasters.

In this study, the majority of the mothers were breast- feeding, which was good for both child and the mother. Most of the children were breast-fed on demand, that is no time-table was used. Similar findings were also reported earlier by Maletnlema (1983); and TFNC (1980). Breast-feeding on demand enables children to receive adequate nutrients for growth.

Bottle-feeding in Morogoro Urban is less practised since only 8.7 percent of the children were bottle-fed. As was pointed out in chapter II, bottle-feeding is not good for the child. The main reason is that it is not easy for most mothers to keep feeding bottle clean. Secondly, mothers are tempted to overdilute the milk formula because it is too expensive. This practice can cause gastroenteritis problems which can lead to diarrhoea

and hence malnutrition. The finding of this study differs from those reported by Yohani (1981) who found that most mothers in urban areas used bottle-feeding method.

Several mixtures were used as weaning foods. Most of these mixtures were starchy-based foods. It was noted that the use of oil, fat or "power flour" in those mixtures was still uncommon. Therefore most foods were found to be too bulky. In such cases, a high feeding frequency is needed because the child's small stomach does not allow consumption of a large amount of food at one time. Therefore, several small meals are required to meet nutrient and energy requirements of the child. Implicitly adequate feeding frequency is very important. The findings of this study are in agreement with the findings of Hellstrom et al (1981); Mgaza (1980); Latham (1984); Nyangàli (1986) and Jonsson (1986).

Workload of the mother is the also a factor associated with nutritional status of children in Morogoro Urban. The majority of the mothers had no helpers (Table 18) so they perform most of the household chores and agricultural activities and as a result less time was available for taking care of the children. This contributed to malnutrition. Mothers had to perform numerous tasks such as collecting firewood, fetching water, flour preparation, cultivation and food preparation for the whole family. An African mother is so busy throughout the day, as pointed out by Kahurananga (1980)

that they have less time to rest and that they have to work on average 16 hours per day. In the present study, it was also found that mothers were too busy throughout the day. Furthermore, it was found that some mothers still use mortar and pestle in flour preparation and cultivate by hand hoes. All these activities require energy and time on the part of the woman. Mothers' workload is affected by the seasonal cycle whereby during the agricultural season child care and agricultural work compete for the mother's time and energy (Palmer 1981).

In this study parity of the mother was not found to be an important factor associated with nutritional status of children. It was found that mothers who had several children had low cases of malnutrition. Also relatively high percentages of malnourished children were observed in families of small sizes.

Majority of the mothers had only one child. This is because most of the mothers in the sample were young. It was found that on average the families in Morogoro Urban consisted of 5 members. According to Mohmoud (1983), the size of the family has influence on the rate of malnutrition, as more malnourished children were found in large families. The findings of this study differ from those reported by Mohmoud (1983) because in this study large families seemed to have low percentage of malnourished cases compared to small families.

Young mothers had high percentage of malnourished

children. The high percentage of malnourished children amongst young mothers corresponds with the findings of Sarakikya et el (1987). Perhaps, young mothers may lack confidence on how to take care of their children which leads to malnutrition.

Different types of diseases (Table 23) affect children in Morogoro Urban. The results showed that fever, malaria and diarrhoea affected many children. In some cases, malnutrition occurred because of infectious diseases. When the child is sick appetite is lost so the child gets easily malnourished. This opinion is in agreement with the findings of FAO (1984); TFNC (1988; 1987); Ryan (1984); and Mhando (1985).

Most of the children received their treatments from the hospitals rather than traditional doctors. Immunization of children in Morogoro Urban was found to be very successful. It was found that 96.9 percent of the children were immunized.

In Morogoro Urban, the majority of the children were delivered with a birth weight of 3-4 kg. Thirteen point eight (13.8) percent of children had a birth weight of 1-2 kg. Children born with low birth weight (1-2 kg) were likely to be malnourished. Kavishe (1984) reported that the prevalence of low birth weights in Tanzania is between 10-25 percent. Therefore, the finding of the present study which showed that 13.8 percent of the children in Morogoro Urban were born with low birth weight of 1-2 kg

is within this estimate. The high prevalence of low birth weights can be attributed to the mother's poor nutritional status during pregnancy aggravated by heavy workload (Tafari et al 1980; Materu 1983; Ebrahim 1983; and Bantje 1980).

The malnutrition rate (30.1 percent - Appendix C) amongst children of 0-6 months was too high. It is not common to find such high malnutrition rate among children of 0-6 months. High malnutrition rate is usually common among children of 1-3 years of age (TFNC 1980; Jonsson 1986; Sarakikya et al 1987). The high prevalence of malnutrition in the age group of 0-6 months cannot be easily explained and should be considered a subject for further research.

It was found that there were high percentages of well-nourished children belonging to married mothers. These findings agree with the findings of Andersen et al (1972). Unemployed mothers who seemingly had more time to take care of their children had high percentage of malnourished children. This is probably due to inadequate income of the mothers.

It was also found that farmers had high percentage of malnourished children. Farmers spend a great deal of time cultivating and hence relatively less time for their children. These findings agree with the findings of Tafari et al (1980); Galvin (1985) and Nestle (1985). That is even when food is available, women have less time

to prepare it due to long working hours in the field and other household chores. In the case of employed mothers having a relatively lower percentage of malnourished children, it corresponds with findings of Popkin and Carloni (1981) that there is a significant relationship between women's participation in daily food purchasing and their wage employment particulary among lower socio-economic groups.

In this study five main hypothesis were tested. Table 31 showed a summary of the independent variables which were significant at $P<0.001$ and 0.010.

Hypothesis number one stated that there is a significant difference between factors affecting malnourished and well-nourished children. This hypothesis was rejected. The factors affecting malnourished and well-nourished children are the same.

Hypothesis number two stated that: (a) Malnutrition is significantly independent of level of income. The hypothesis was accepted. The two variables are independent. (b) Malnutrition is significantly independent of mother's level of education. The hypothesis was accepted. The two variables are independent.

Hypothesis number three stated that (a) Malnutrition is significantly independent of methods of feeding that is breast-feeding or bottle-feeding. In the case of breast-feeding method the hypothesis was rejected, while in the

case of bottle-feeding method the hypothesis was accepted. Malnutrition is dependent on breast-feeding but independent of bottle-feeding. (b) Malnutrition is significantly independent of type of weaning foods. The hypothesis was accepted. The two variables are independent. (c) Malnutrition is significantly independent of feeding frequency. The hypothesis was rejected. The two variable are dependent.

Hypothesis number four stated that: (a) Malnutrition is significantly independent of workload of the mother. The hypothesis was accepted. The two variable are independent. (b) Malnutrition is significantly independent of the age of the mother. The hypothesis was accepted. The two variables are independent. (c) Malnutrition is significantly independent of parity of the mother. The hypothesis was accepted. The two variable are independent.

Hypothesis number five stated that malnutrition is significantly independent of infection and diseases. The hypothesis was accepted. The two variables are independent.

Breast-feeding method was positivelly significant at $P<0.001$. This situation was contributed by other indirect factors being positivelly correlated with nutrtional status (weight-for-age). These indrect factors were: age of cessation of breast-feeding (Correlation coefficient 0.1282); feeding frequency of other foods than milk

(Correlation coefficient 0.0353); commencement of breast-feeding after delivery (Correlation coefficient 0.0138); frequency of breast-feeding during daytime (Correlation coefficient 0.0053); family size (Correlation coefficient 0.0043); birth weight (Correlation coefficient 0.0090); admission of the child in hospital (Correlation coefficient 0.0003); number of children (Correlation coefficient 0.0030); money spend on food per month (Correlation coefficient 0.0059); hectares cultivated (Correlation coefficient 0.0007); production of food (Correlation coefficient 0.0009) and age of the mother (Correlation coefficient 0.0011).

Frequency of breast-feeding during daytime was positively significant at $P<0.010$. This situation has been influenced by other factors such as: age of cessation of breast-feeding (Correlation coefficient 0.1289); breast- feeding method (Correlation coefficient 0.0861); feeding frequency of other foods than milk (Correlation coefficient 0.0408); commencement of breast-feeding after delivery (Correlation coefficient 0.0370); money spent on food per month (Correlation coefficient 0.0156); family size (Correlation coefficient 0.0032); age of the mother (Correlation coefficient 0.0012); admission of the child in hospital (Correlation coefficient 0.0024); age of the mother when getting the first child (Correlation coefficient 0.0113); bags per hectare harvested (Correlation coefficient 0.0016); number of children

(Correlation coefficient 0.001) and birth weight (Correlation coefficient 0.0016).

Age of the child when stopped breast-feeding was negativelly significant at P<0.001. This can be attributed to reduced indirect factors such as: breast-feeding after delivery (Correlation coefficient -0.1102); start of breast-feeding after delivery (Correlation coefficient -0.0406); bottle-feeding (Correlation coefficient -0.0012); feeding frequency of other foods than milk (Correlation coefficient -0.0383); hectare cultivated (Correlation coefficient -0.0021); immunization of the child Correlation coefficient -0.0054); family size (-0.0062); breast-feeding frequency during daytime (Correlation coefficient -0.0068) and money spend on food per month (Correlation coefficient -0.0072).

Feeding frequency of foods other than milk was negatively significant at P<0.001. This condition was attributed to other reduced indirect factors correlated to nutritional status. These indirect factors included: age of cessation of breast-feeding (Correlation coefficient -0.0271); Breast-feeding (Correlation coefficient -0.0214); money spend on food per month (Correlation coefficient -0.0138); age of the mother when getting the first child (Correlation coefficient -0.0175); frequency of breast- feeding during daytime (Correlation coefficient -0.0015); earning per month:- income generating project (Correlation coefficient -0.0074);

admission of the child in hospital (Correlation coefficient -0.0082) and duration of admission (Correlation coefficient -0.0025).

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The following conclusions were derived from the findings of this study.

1. The rate of malnutrition in Morogoro Urban is still high in spite of all efforts which have been made to educate the mothers on nutrition matters especially at the MCH clinics. The study has shown that underweight is very common followed by Kwashiorkor and Marasmus. This situation might be attributed to several factors such as low feeding frequency hence inadequate nutrient intake. High rate of malnutrition in Morogoro Urban is due to inadequate feeding frequency of foods other than milk. Feeding frequency of two to three times per day is not enough for the growing child. Higher feeding frequency is very important. The recommended feeding frequency for the underfive is 4-6 times per day.

2. Inadequate food availability poses a problem. The ability of the family to obtain adequate foods especially for the underfives is important. A high percentage of malnourished children has been observed among low income

earners facing difficulties to meet requirements of the family. For the majority, only 1-2 hectares were cultivated by each family. As a result a few bags of yield are harvested which cannot last for the whole season. Hand hoe is still used because women cannot afford to hire tractors as they are too expensive. High percentages of well-nourished children were found amongst employed mothers and mothers who were engaged in income generating projects. This situation might be attributed to adequate education of the mother who were employed and had adequate income in the case of mothers who were involved in income generating activities.

3. Mother's education is a very important factor associated with the nutritional status of a child. This has been evidenced by the absence of malnutrition among children of university educated mothers and low cases of malnourished children amongst secondary school educated mothers. While higher percentages of malnourished children were found among primary school leavers and those mothers who did not go to school.

4. In this study it was found that beliefs and taboos are not serious factors associated with nutritional status of children.

5. There is evidence of the positive contribution of breast-feeding practices to child nutritional status. Breast-feeding frequency; commencement of breast-feeding after delivery and age of cessation of breast-feeding contributed positively to child nutritional status. Almost all mothers breast-fed their children. Mothers breast-fed their children immediately after delivery. In this case, the children benefit from getting the first-milk or colostrum which is very important for the supply of antibodies to the child. The findings further reveal that mothers breast-feed their children on demand, so they get adequate nutrients from mothers' milk. Also, it was found that most children were breast-fed up to the recommended age that is 18-24 months. This is a good practice as the children get adequate nutrients from mothers' milk hence good nutritional status.

   Abrupt method of stopping the child from breast-feeding which was mainly used is not good for the health of both child and mother. Gradual method of stopping the child from breast-feeding should be practised.

   Few mothers practise bottle-feeding. This method is not good for several reasons such as the high price of milk forced mothers to

overdilute the formula preparations and difficulty in keeping the feeding bottles clean. It was revealed by this study that most of the mothers do not know how to treat feeding bottles properly after feeding.

6. There is evidence that the use of oil/fats and "power flour" in food mixtures for reduction of bulkiness in starchy foods is still uncommon. Most of the children in Morogoro Urban are weaned at the early stage of 2-3 months of age. This can cause the child to have diarrhoea and hence malnutrition. The main reason for early weaning could be mothers resuming work for those employed in the formal sector.

7. Mothers perform activities such as cultivation, collection of firewood, fetching water, food processing and preparation and taking care of the family. Such heavy workload of the mother may lead to inadequate feeding frequency hence malnutrition.

8. Mothers with high parity and large families had lower percentage of malnourished children. This might be because older children or relatives in these families take care of the young. Secondly, the adult members of the family might be working so contributing some income to the family.

9. Young mothers had higher percentage of malnourished children. Young mothers are inexperienced about proper child care and upbringing.
10. The immunization coverage at 96.9 percent was considered high. The most prevelant diseases among children were fever and malaria.
11. The findings of this study indicated that there was a relatively high percentage of malnutrition among children aged 0-6 months. Such malnutrition rate in this age group (0-6 months) cannot be easily explained and should be considered a subject for further research.
12. Most of the mothers deliver their children weighing 3-4 kg. Malnutrition could be due to early weaning plus other factors.
13. Unmarried mothers had high percentage of malnourished children compared to married mothers.

6.2 Recommendations

Based on the findings of the study the following recommendations can be made:

1. There is need for a multi-disciplinary action programme on nutrition education at the grassroot level (family level). This involves all sectors dealing with nutrition including

health workers; womens' organizations; policy makers and other related sectors in order to eradicate malnutrition problem in Morogoro Urban.

2. Mothers should be assisted by financial institutions to engage in income generating projects.

3. The majority of the mothers cultivate 2-3 hactares by using hand hoe. The Government could assist mothers by reducing the prices of hiring tractors so that even the low income families can afford to use them for cultivation. Mothers could also be trainned to use oxen in cultivation so as to ease their heavy workload.

4. Through nutrition education mothers should be encouraged to wean their children at the recommended age that is 4-6 months old. They should be encouraged to use "power flour" or oil and fat in food mixtures in order to reduce the bulkiness of starchy weaning foods. They should also be advised to feed their children at least 4-6 times per day. Mothers should be encouraged to continue to feed or breast-feed the child when sick.

5. The Government and other relevant institutions should ensure that women have access to appropriate technologies to reduce their heavy

workload so that they can have enough time to take care of their children and the family.

6. Young mothers have problems. The Marriage Act of 1971 be revised to increase the marriage age for girls to 18 years to alleviate malnutrition problems resulting from inexperienced young mothers.

7. Suggestions for further research: There is a need to conduct further research on the prevalence of child malnutrition and factors associated with it in Morogoro Urban and Rural Districts in order to draw comparison between the factors associated with malnourished and well-nourished children. The comparison between factors associated with malnourished and well-nourished children in the rural and urban areas will facilitate ways of alleviating the malnutrition problems. Case studies on home-visiting is another important area for research because such case studies will provide information based on direct observations of malnutrition cases. In addition, a longitudinal study can be conducted on the nutritional status of children during different seasons over a period of time.

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APPENDIX A

LIST OF MCH CLINICS INCLUDED IN THE STUDY

Morogoro Government Hospital

Morogoro Government Hospital - Nuru

Sabasaba

Uhuru

Kiwanja cha Ndege

Tumbaku

APPENDIX A

LIST OF MCH CLINICS INCLUDED IN THE STUDY

Morogoro Government Hospital

Morogoro Government Hospital - Nuru

Sabasaba

Uhuru

Kiwanja cha Ndege

Tumbaku

APPENDIX B

SOKOINE UNIVERSITY OF AGRICULTURE

FACULTY OF AGRICULTURE

DEPARTMENT OF AGRICULTURAL EDUCATION AND EXTENSION

TITLE: PREVALENCE OF CHILD MALNUTRITION AND FACTORS ASSOCIATED WITH IT: A CASE STUDY OF MOROGORO URBAN

A QUESTIONNAIRE FOR MOTHER - CHILD PAIRS

I. GENERAL INFORMATION

1. Respondent serial Number .....Date 1990
2. Name of Respondent.....
3. District ..... Division .....
4. Ward ..... Area/street
5. Ten Cell Leader .....
6. Name of MCH Clinic

..... 1. Morogoro Government Hospital
2. NURU
3. Tumbaku
4. Kiwanja cha Ndege
5. Sabasaba
6. Uhuru

7. Age of the mother (check one)

..... 1. Under 14 years old

..... 2. Between 15-20 years old

..... 3. Between 21-25 years old

..... 4. Between 27-32 years old

..... 5. Between 33-38 years old

..... 6. Between 39-44 years old

..... 7. Between 45-50 years old

..... 8. Above 50 years old

8. Marital Status (check one)

..... 1. Unmarried

..... 2. Married

..... 3. Widowed

..... 4. Divorced

9.1 Occupation of the mother

..... 1. Farmer

..... 2. Employed in private or public Sector

..... 3. Unemployed

..... 4. Others (Specify)

9.2 Type of work

..... 1. Teacher

..... 2. Nurse

..... 3. Agriculture extension officer

..... 4. Community worker

..... 5. Secretary

..... 6. Others (specify)

9.3 How much do you earn per month?

..... 1. Below 2,000.00

..... 2. 2,000.00 - 5,000.00

..... 3. 5,000.00 and above

10. Number of people in the household.

1. Total number of adults

(i) Male .....

(ii) Female .....

2. Total number of children; under 5 years

(i) Male.....

(ii) Female .....

3. Over 5 years

(i) Male.....

(ii) Female .....

2. FAMILY INCOME

11. What is the major source of income for your family?

..... 1. Salary/Wages

..... 2. Income generating project

..... 3. Others (Specify)

12. If income generating project;

12.1 What type of project?

..... 1. Poultry rearing

..... 2. Pig keeping

..... 3. Rabbit keeping

..... 4. Goat and sheep rearing

..... 5. Cattle raising

..... 6. Sewing/Tailoring

..... 7. Brewing beer

..... 8. Pottery

..... 9. Sale of cooked food

..... 10. Sale of vegetables and fruits

..... 11. Hair dressing

..... 12. Shop owners

..... 13. Others (specify)

12.2 How much do you earn per month from income generating projects?

..... 1. Below Tsh 2,000.00

..... 2. Between Tsh 2,000.00 - 5,000.00

..... 3. Above Tsh 5,000.00

3. LEVEL OF EDUCATION

13. What is the highest level of education that you attained?

..... 1. Did not go to School

..... 2. Adult education

..... 3. Primary education

(i) (Std I-IV)

(ii) (I-VII or VIII)

..... 4. Secondary education

..... 5. University education

..... 4. Goat and sheep rearing

..... 5. Cattle raising

..... 6. Sewing/Tailoring

..... 7. Brewing beer

..... 8. Pottery

..... 9. Sale of cooked food

..... 10. Sale of vegetables and fruits

..... 11. Hair dressing

..... 12. Shop owners

..... 13. Others (specify)

12.2 How much do you earn per month from income generating projects?

..... 1. Below Tsh 2,000.00

..... 2. Between Tsh 2,000.00 - 5,000.00

..... 3. Above Tsh 5,000.00

3. LEVEL OF EDUCATION

13. What is the highest level of education that you attained?

..... 1. Did not go to School

..... 2. Adult education

..... 3. Primary education

(i) (Std I-IV)

(ii) (I-VII or VIII)

..... 4. Secondary education

..... 5. University education

4. METHODS OF FEEDING

Breast-feeding

14. How old is your child? (check one)

..... 1. 0-6 months

..... 2. 7-12 months

..... 3. 13-18 months

..... 4. 19-24 months

..... 5. Above 24 months

15.1 Do you breast-feed?

..... 1. Yes

..... 2. No.

15.2 If yes how soon did you start breast-feeding after delivery?

..... 1. Immediately after delivery?

..... 2. 1-3 hours

..... 3. 4-6 hours

..... 4. 7-9 hours

..... 5. 10-12 hours

..... 6. 13-15 hours

..... 7. 16-18 hours

..... 8. 19-21 hours

..... 9. 22-24 hours

..... 10. Above 24 hours

15.3 How many times do you breast-feed your baby during the day time?

..... 1. Anytime she/he wants

..... 2. Once per day

..... 3. Twice per day

..... 4. Three times per day

..... 5. Four times per day

..... 6. Five times per day

..... 7. Others (specify)

15.4 If yes how many times do you breast-feed your baby during the night time?

..... 1. Anytime she/he wants

..... 2. Once per night

..... 3. Twice per night

..... 4. Three times per night

..... 5. Four times per night

..... 6. Five times per night

..... 7. Others (specify)

16.1 If no, why not?

..... 1. The baby refused to suckle

..... 2. Not enough milk

..... 3. Illness of the mother

..... 4. Illness of the child

..... 5. Others (specify)

16.2 How old was the baby when he/she stopped breast-feeding?

..... 1. Less than 1 month

..... 2. 2-6 months

..... 3. 7-12 months

..... 4. 13-18 months

..... 5. 19-24 months

..... 6. Above 24 months

16.3 Why did the baby stop breast-feedings

..... 1. Mother had to go away

..... 2. Mother was sick

..... 3. Baby was sick

..... 4. Baby was old enough

..... 5. Not enough milk

..... 6. Pregnancy

..... 7. Others (specify)

16.4 How did the baby stop breast-feeding?

..... 1. Abruptly

..... 2. Gradually

16.5 If abruptly what methods were used to stop the baby?

1. The baby was taken away from the mother
2. The application of unpleasant stuffs on the breasts e.g. Cowdung or pepper.
3. The breasts were covered e.g. plaster
4. The baby was left to cry until it gets tired
5. Others (specify)

17.1 Do you bottle-feed your baby?

..... 1. Yes

..... 2. No

17.2 If yes what type of food?

..... 1. Milk

..... 2. Fruit juice

..... 3. Water

..... 4. Porridge

..... 5. Others (specify)

18. How do you treat your bottle after feeding?

..... 1. Washing with water only

..... 2. Washing with water and soap

..... 3. Washing and boiling

..... 4. Others (specify)

19.1 Do you continue breast-feeding your child when he/she sick?

..... 1. Yes

..... 2. No

19.2 If no why:

..... 1. she/he refuses to eat

..... 2. she will vomit

..... 3. she will become worse

..... 4. It is bad for the child

..... 5. It is bad for the mother

..... 6. Others (specify)

5. WEANING FOODS

20. At what age do you start to give food other than milk to your baby?

..... 1. Less than a month

..... 2. 2-3 months

..... 3. 4-6 months

..... 4. 7-9 months

..... 5. Above 9 months

21. Who feeds the baby?

..... 1. Myself

..... 2. Older children

..... 3. Housemaid

..... 4. Others (specify)

22. What first feed other than milk do you give to your baby?

..... 1. Fruit juice

..... 2. Porridge

..... 3. Fruit

..... 4. Others (specify)

23.1 What type of weaning food do you give to your baby?

..... 1. Maize flour porridge with water

..... 2. Maize flour porridge with milk

..... 3. Maize flour porridge mixed with bean four

..... 4. Maize flour porridge mixed with groundnut flour.

..... 5. Maize flour porridge mixed with small fish (dagaa)

..... 6. Maize flour porridge mixed with vegetable.

..... 7. Mashed potatoes or bananas mixed with vegetables.

..... 8. Maize flour porridge mixed with egg yolk.

..... 9. Maize flour porridge with cooking oil or fat added.

..... 10. Power flour or "Kimea" porridge

..... 11. Others (Specify).

23.2 How many times do you feed your baby per day?

..... 1. Once per day

..... 2. Twice per day

..... 3. Three times per day

..... 4. Four times per day

..... 5. More than five times per day.

6. WORK LOAD OF THE MOTHER

24. Who helps you with the household work?

..... 1. Older children

..... 2. Husband

..... 3. Housemaid

..... 4. Myself

..... 5. Others (Specify)

25.1 What type of fuel do you use for cooking?

..... 1. Firewood

..... 2. Charcoal

..... 3. Kerosene

..... 4. Electricity

..... 5. Gas

25.2 If firewood how do you get it?

..... 1. It is bought

..... 2. It is collected

25.3 If bought how much do you spend on fuel per day?

..... 1. Less than Tsh 50

..... 2. Tsh 50

..... 3. Tsh 60

..... 4. Tsh 70

..... 5. Tsh 80

..... 6. Tsh 90

..... 7. Tsh 100

..... 8. More than Tsh 100

25.4 If collected how far do you have to walk to collect it?

..... 1. Less than 1 km

..... 2. 1-2 km

..... 3. 3-4 km

..... 4. More than 4 km

26. Where do you get water for home use?

..... 1. Water tap

..... 2. Wells

..... 3. Streams

27.1 Production of the food

1. Do you produce your own food?

..... 1. Yes

..... 2. No

a. If yes who cultivated?

1. Myself ( )

2. Myself & My husband ( )

3. Myself & Children ( )

4. Hired labour ( )

5. Machinery-tractor ( )

6. Oxen ( )

b. If no how do you get your own food?

1. Bought ( )

2. From friends ( )

3. Other (specify)

c. If bought how much do you spend on food per month?

1. Less than Tsh 500 ( )

2. Tsh 500 - 600 ( )

3. Tsh 700 - 800 ( )

4. Tsh 900 - 1000 ( )

5. Tsh 1100 - 1200 ( )

6. More than Tsh 1200 ( )

d. If cultivating how many hectares?

1. Less 1 hectare ( )

2. 2 - 3 hectares ( )

3. 4 - 5 hectares ( )

4. More than 5 hectares ( )

e. If cultivating how many bags per hectare?

1. 1 - 2 bags ( )
2. 3 - 4 bags ( )
3. 5 - 6 bags ( )
4. 7 - 8 bags ( )
5. 9 - 10 bags ( )
6. More than 10 bags ( )

27.2 If yes what type of crop do you cultivate

..... 1. Beans
..... 2. Maize
..... 3. Rice
..... 4. Sorghum
..... 5. Cassava
..... 6. Bananas
..... 7. Sweet potatoes
..... 8. Vegetables
..... 9. Fruits
..... 10. Others (specify)

28. How do you prepare maize flour/rice for household consumption?

..... 1. Mortar and pestle
..... 2. Milling machine
..... 3. Others (specify)

7. PARITY OF THE MOTHER

29.

Number of children	Alive		Dead		Below 5 Years
	Male	Female	Male	Female	

30. How old were you when you got your first baby?

..... 1. Below 14 years old

..... 2. 15-18 years old

..... 3. 19-22 years old

..... 4. 23-26 years old

..... 5. 27-30 years old

..... 6. 31-34 years old

..... 7. 35-38 years old

..... 8. 39-42 years old

..... 9. 42 and above

8. INFECTION AND DISEASES

31. Where do you get treatment for your children when they are sick?

..... 1. Hospital

..... 2. Traditional doctor

..... 3. Others (specify)

32.1 Have any of your children undergone treatment in the past 3 months?

..... 1. Yes

..... 2. No

32.2 If yes, for what illness?

..... 1. Fever

..... 2. Vomiting

..... 3. Diarrhoea

..... 4. Others (specify)

32.3 Was the child admitted?

..... 1. Yes

..... 2. No

32.4 If yes, for how long? .....

33. Has your child been immunised?

..... 1. Yes

..... 2. No

33.1 If yes, what type of immunization?

..... 1. BCG

..... 2. Polio

..... 3. DPT

..... 4. Measles

..... 5. Others (specify)

33.2 If no, why not?

..... 1. Not necessary

..... 2. Staying far away from MCH Clinic

..... 3. I do not know

..... 4. Others (specify)

9. BELIEFS AND TABOOS

34. What are the foods that are forbidden to be given to your children?

Forbbiden foods	Reasons

35.1 Do you continue feeding the child when she/he is sick?

..... 1. Yes

..... 2. No

35.2 If no, why not?

..... 1. She/he refuses to eat

..... 2. She/he will vomit

..... 3. She/he will become worse

..... 4. It is bad for the child

..... 5. Others (specify)

35.3 What are the foods that are forbidden to be given to the sick child?

Forbidden	Reasons

10. RATE OF MALNUTRITION

36. Weight-for-Age. (Growth Monitoring chart)

Name of the child	Age month (2)	Birth weight kg (3)	Present weight kg (4)	Childhood diseases (5)	Green/ Grey/ Red (6)	Well-nourished/ malnourished

SOKOINE UNIVERSITY OF AGRICULTURE

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TITLE: PREVALENCE OF CHILD MALNUTRITION AND FACTORS ASSOCIATED WITH IT: A CASE STUDY OR MOROGORO URBAN

A QUESTIONNAIRE FOR MCH NURSES/COORDINATORS

1. GENERAL INFORMATION

Respondent Code Number ..... Date 1990

District ..... Division .....

Ward ..... MCH centre .....

2. What are the most common forms of malnutrition among underfive children in your clinic? (List in ascending order: 1-3).

1. Very common
2. Common
3. Not common

..... 1. Kwashiorkor

..... 2. Marasmus

..... 3. Marasmic - Kwashiorkor

..... 4. Underweight

..... 5. Anaemia

SOKOINE UNIVERSITY OF AGRICULTURE

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A QUESTIONNAIRE FOR MCH NURSES/COORDINATORS

1. GENERAL INFORMATION

Respondent Code Number ..... Date 1990

District ..... Division .....

Ward ..... MCH centre .....

2. What are the most common forms of malnutrition among underfive children in your clinic? (List in ascending order: 1-3).

1. Very common
2. Common
3. Not common

..... 1. Kwashiorkor

..... 2. Marasmus

..... 3. Marasmic - Kwashiorkor

..... 4. Underweight

..... 5. Anaemia

3. How many children were malnourished in the last three months?

Month	Malnutrition forms			
	Kwashiorkor	Marasmus	Mar/Kwashiorkor	Under weight
1st	.....	.....	.....	.....
2nd	.....	.....	.....	.....
3rd	.....	.....	.....	.....

4. What do you think are the reasons contributing to malnutrition in Morogoro Urban?

.....

.....

.....

.....

.....

5. What is your opinion on how to minimize the problem of malnutrition in Morogoro Urban?

.....

.....

.....

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TITLE: PREVALENCE OF CHILD MALNUTRITION AND FACTORS ASSOCIATED WITH IT: A CASE STUDY OF MOROGORO URBAN

A QUESTIONNAIRE FOR NURU WORKERS/NURSES

1. GENERAL INFORMATION

Respondent Code Number..... Date .....

1990

District ..... Division

.....

Ward ..... Centre NURU

2. How many malnourished children are presently admitted in this Unit?

3. What forms of malnutrition cases are common among those admitted?

..... 1. Kwashiorkor

..... 2. Marasmus

..... 3. Marasmic - Kwashiorkor

..... 4. Underweight

..... 5. Others (specify)

4. How many malnourished children have been admitted in the last three months?

..... 1. Kwashiorkor

..... 2. Marasmus

..... 3. Marasmic - Kwashiorkor

..... 4. Underweight

5. Which group of children are commonly admitted? (list in ascending order: 1-3)

1. Very common
2. Common
3. Not common

1. 0-6 months ( )
2. 7-12 months ( )
3. 13-18 months ( )
4. 19-24 months ( )
5. 25-30 months ( )
6. 31 and above ( )

6. What are the major causes/reasons for child admission?

..... 1. Marasmic - Kwashiorkor

..... 2. Kwashiorkor

..... 3. Marasmic

..... 4. Underweight

..... 5. Anaemia

..... 6. Others (specify)

7. If Kwashiorkor, what do you think are the causes that contribute to such a condition

APPENDIX C

The rate of underfive children suffering from malnutrition in Morogoro Urban

Formula:

$$\frac{\text{Number of underfive children malnourished}}{\text{Number of total underfive children surveyed}} \times 100$$

In this case the actual sample surveyed was found to be 200 mother-child pairs. Two samples were missing during the data analysis. So there were 198 samples analyzed.

(a) Mildly malnourished children (percent).

Number of underfive children malnourished: 50

Number of total underfive children surveyed: 198

Therefore $\frac{50}{198} \times 100 = 25.25252525$
$= 25.3$ percent.

(b) Severely malnourished children (percent)

Number of underfive children malnourished: 10

Number of total underfive children surveyed: 198

Therefore $\frac{10}{198} \times 100 = 5.05050505$
$= 5.1$ percent

(c) Total malnourished children: Malnutrition rate: Mildly malnourished + Severely malnourished

= 25.3 + 5.1 = 30.4 percent.

APPENDIX D_1 - D_{10}: TABLES

1. Types of Fuel used as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Type of fuel used									
	Fire-wood	Char-coal	Kero-sine	Electri-city	Gas	Fire-wood and Kero-sine	Char-coal and elect-ricity	Fire-wood and char-coal	Char-coal and kero-sine	Total
Well-nourished Children	67.3 (35)	66.7 (44)	95.0 (96)	85.7 (6)	- -	80.0 (8)	83.3 (5)	85.8 (12)	73.3 (22)	69.7 (138)
Mildly malnourished Children	23.1 (12)	30.3 (20)	5.0 (5)	14.3 (1)	- -	20.0 (2)	16.7 (1)	7.1 (1)	26.7 (8)	25.3 (50)
Severely malnourished Children	9.6 (5)	3.0 (2)	-	-	100.0 (2)	-	-	7.1 (1)	-	5.0 (10)
Total	100.0 (52)	100.0 (66)	100.0 (11)	100.0 (7)	100.0 (2)	100.0 (10)	100.0 (6)	100.0 (14)	100.0 (30)	100.0 (198)[a]

Keys: ( ) : Numbers in brackets indicate frequencies of responses

- : No responses

a : Total number of mothers in the sample

2. Source of Firewood (Distance in km.) as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Distance in k.m.			
	Less than 1 km	1-2 km	3-4 km	Total
Well-nourished children	72.7 (16)	66.6 (4)	50.0 (1)	70.0 (21)
Mildly Malnourished children	18.2 (4)	16.7 (1)	50.0 (1)	20.0 (6)
Severely Malnourished children	9.1 (2)	16.7 (1)	-	10.0 (3)
Total	100.0 (20)	100.0 (6)	100.0 (2)	100.0 (30)[a]

Keys: ( ): Numbers in brackets mean frequencies of responses

-: No responses

a: Total number of mothers who collect firewood as their sources of fuel.

3. The Production of Family Food as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Food Production		
	Produce themselves	Do not produce themselves	Total
Well-nourished Children	71.5 (98)	65.6 (40)	69.7 (138)
Mildly malnourished Children	23.4 (32)	29.5 (18)	25.3 (50)
Severely malnourished Children	5.1 (7)	4.9 (3)	5.0 (10)
Total	100.0 (137)	100.0 (61)	100.0 (198)[a]

Keys: ( ): Numbers in brackets mean frequencies of responses

- : No responses

a : Total number of mothers in the sample.

4. Methods of Getting Food if Not Cultivated as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Methods of getting food		
	Bought	Given by friends or employer and relatives	Total
Well-nourished Children	65.0 (39)	100.0 (1)	65.6 (40)
Mildly malnourished Children	30.0 (18)	-	29.6 (18)
Severely malnourished Children	5.0 (3)	-	4.9 (3)
Total	100.0 (60)	100.0 (1)	100.0 (61)[a]

Keys: ( ): Numbers in brackets mean frequencies of responses

- : No responses

(a): Total number of mothers in the sample who did not produce their food themselves.

5. Types of Help Available in Cultivation as Associated with Malnourished and Well-nourished children (percent)

Nutritional Status	Type of cultivation							
	Myself	Myself and husband	Myself and Children	Hired labour	Machinery	Oxen	Relatives	Total
Well-nourished Children	60.0 (15)	75.6 (34)	75.0 (3)	79.3 (23)	72.2 (13)	66.7 (10)	-	71.5 (98)
Mildly malnourished children	24.0 (6)	22.2 (10)	-	17.3 (5)	27.8 (5)	33.3 (5)	100.0 (1)	23.4 (32)
Severely malnourished Children	16.0 (4)	2.2 (1)	25.0 (1)	3.4 (1)	-	-	-	5.1 (7)
Total	100.0 (25)	100.0 (45)	100.0 (4)	100.0 (29)	100.0 (18)	100.0 (15)	100.0 (1)	100.0 (137)[a]

Keys: ( ): Numbers in brackets indicate frequencies of responses

- : No responses

a : Total number of the mothers in the sample who produce the family food.

6. Methods of Grain Preparation as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Methods of flour preparation			
	Mortar and Pestle	Milling machine	Mortar and pestle and Milling Machine	Total
Well-nourished Children	50.0 (6)	69.9 (123)	80.0 (8)	69.2 (137)
Mildy malnourished Children	33.3 (4)	26.1 (46)	10.0 (1)	25.8 (51)
Severely malnourished Children	16.7 (2)	4.0 (7)	10.0 (1)	5.0 (10)
Total	100.0 (12)	100.0 (176)	100.0 (10)	100.0 (198)[a]

Keys: ( ): Numbers in brackets mean frequencies of responses

a: Total number of mothers in the sample.

7. Source of Water as Associated with Malnourished and Well-nourished children (percent)

Nutritional Status	Source of Water			
	Water tap	Wells	Streams	Total
Well-nourished Children	70.4 (133)	80.0 (4)	25.0 (1)	69.7 (138)
Mildly malnourished Children	25.4 (48)	-	50.0 (2)	25.3 (50)
Severely malnourished Children	4.2 (8)	20.0 (1)	25.0 (1)	5.0 (10)
Total	100.0 (189)	100.0 (5)	100.0 (4)	100.0 (198)[a]

Keys: ( ): Numbers in brackets mean frequencies of responses

-: No responses

a: Total number of mothers in the sample.

8. Hectares Cultivated as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Hectares cultivated				
	Less than 1 hectare	2 - 3 hectares	4 - 5 hectares	More than 5 hectares	Total
Well-nourished Children	52.8 (19)	79.1 (68)	77.8 (7)	66.7 (4)	71.5 (98)
Mildly malnourished Children	33.3 (12)	18.6 (16)	22.2 (2)	33.3 (2)	23.4 (32)
Severely malnourished Children	13.9 (5)	2.3 (2)	-	-	5.1 (7)
Total	100.0 (36)	100.0 (86)	100.0 (9)	100.0 (6)	100.0 (137)[a]

Keys: ( ): Numbers in brackets mean frequencies of responses

-: No responses

a: Total number of mothers in the sample who produced their own food

9. Yield (Maize/Rice) Harvested per Hectare as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Bags per Hectare						
	1-2	3-4	5-6	7-8	9-10	More than 10	Total
Well-nourished Children	45.0 (9)	71.7 (33)	84.8 (28)	70.0 (7)	-	80.8 (21)	71.5 (98)
Mildly malnourished Children	35.0 (7)	24.0 (11)	15.2 (5)	30.0 (3)	100.0 (2)	15.4 (4)	23.4 (32)
Severely malnourished Children	20.0 (4)	4.3 (2)	-	-	-	3.8 (1)	5.1 (7)
Total	100.0 (20)	100.0 (46)	100.0 (33)	100.0 (10)	100.0 (2)	100.0 (26)	100.0 (137)[a]

Keys: ( ): Numbers in brackets imply frequencies of responses

- : No responses

a : Total number of mothers in the sample who produced their own food.

10. Number of Family Members as Associated with Malnourished and Well-nourished Children (percent)

Nutritional Status	Number of People																	
	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	Eleven	Twelve	Thirteen	Forteen	Fifteen	Seventeen	Eighteen	Twenty one	Total
Well-nourished Children	28.6 (2)	73.5 (25)	82.9 (29)	73.8 (31)	55.6 (10)	52.2 (12)	61.5 (8)	85.7 (6)	80.0 (4)	40.0 (2)	100.0 (3)	-	-	100.0 (1)	100.0 (1)	100.0 (1)	100.0 (1)	68.7 (136)
Mildly malnourished children	57.1 (4)	20.6 (7)	17.1 (6)	21.0 (9)	44.4 (8)	34.8 (8)	23.1 (3)	14.3 (1)	20.0 (1)	60.0 (3)	-	100.0 (1)	100.0 (1)	-	-	-	-	26.3 (52)
Severely malnourished children	14.3 (1)	5.9 (2)	-	4.8 (2)	-	13.0 (3)	15.4 (2)	-	-	-	-	-	-	-	-	-	-	5.0 (10)
Total	100.0 (7)	100.0 (34)	100.0 (35)	100.0 (42)	100.0 (18)	100.0 (23)	100.0 (13)	100.0 (7)	100.0 (5)	100.0 (5)	100.0 (3)	100.0 (1)	100.0 (1)	100.0 (1)	100.0 (1)	100.0 (1)	100.0 (1)	100.0 (198)[a]

Keys: ( ): Numbers in brackets indicate frequencies of responses.

- : No responses

a : Total number of mothers in the sample.

APPENDIX E

Figure 3: Correlations of Some Selected Factors Influencing Nutritional Status as Expressed in Weight-for-Age

	V_{33}	V_3	V_7	V_8	V_{11}	V_{12}	V_{14}	V_{15}	V_{16}	V_{17}	V_{19}	V_{23}	V_{29}	V_{32}	V_{39}	V_{42}	V_{43}	V_{44}	V_{47}	V_{53}	V_{57}	V_{58}	V_{55}	V_{68}
V_{33}	1.0000																							
V_3	-0.0152	1.0000																						
V_7	-0.0178	0.1460	1.0000																					
V_8	-0.0763	0.2135	0.0132	1.0000																				
V_{11}	-0.0743	0.0024	-0.0143	0.0674	1.0000																			
V_{12}	0.0637	-0.3260	0.1533	-0.1359	0.0250	1.0000																		
V_{14}	0.2416	0.0215	-0.1636	-0.0725	0.0059	-0.0823	1.0000																	
V_{15}	0.1335	-0.0282	-0.1132	-0.0435	0.0577	0.0152	0.1731	1.0000																
V_{16}	0.1932	0.0259	-0.5923	-0.0536	0.0755	-0.0502	0.0360	0.1607	1.0000															
V_{17}	0.1193	0.0229	-0.1154	-0.0425	-0.0266	-0.0577	0.0731	0.3135	0.5932	1.0000														
V_{19}	-0.2568	0.0153	0.0312	0.1056	-0.0504	0.0204	-0.7487	-0.5277	-0.7537	-0.6211	1.0000													
V_{23}	-0.0159	0.0395	-0.0569	0.1041	-0.0058	-0.0042	0.0322	-0.2343	0.0930	0.0414	0.0195	1.0000												
V_{29}	-0.1135	0.1414	0.0415	0.0922	-0.0117	0.0715	-0.2402	-0.1537	-0.2563	-0.1926	0.2753	0.0749	1.0000											
V_{32}	-0.2456	0.0199	0.0463	-0.0601	0.0713	0.1253	-0.1455	0.0205	-0.1635	-0.1145	0.1552	-0.0522	0.4644	1.0000										
V_{39}	-0.0173	0.1155	-0.0150	0.0356	0.0025	-0.0956	0.0121	-0.0371	-0.0636	-0.0513	0.0147	0.0497	0.0697	0.0509	1.0000									
V_{42}	0.0248	-0.0892	0.0143	-0.0175	0.0020	0.0573	0.0325	0.0235	0.0657	0.0684	-0.0401	0.0203	-0.0362	-0.0764	-0.8576	1.0000								
V_{43}	0.0121	0.1151	0.1481	0.0926	0.1837	-0.0355	0.0055	-0.0104	-0.0377	-0.0637	-0.0152	0.0435	0.0030	0.0845	0.5845	-0.7308	1.0000							
V_{44}	0.0263	0.0741	0.0970	0.0397	0.1410	-0.0032	0.0359	0.0141	-0.0830	-0.1194	-0.0008	0.0089	-0.0073	-0.0029	0.5830	-0.5620	0.6732	1.0000						
V_{47}	-0.0495	0.5398	-0.0307	0.4130	0.0193	-0.3718	-0.0587	-0.0014	-0.0015	-0.0889	0.0813	0.1046	0.0298	-0.0813	0.2143	-0.2318	0.1744	0.1454	1.0000					
V_{53}	-0.0605	0.1036	0.3510	-0.0616	0.0225	0.1753	0.0230	-0.0116	-0.0822	-0.0505	-0.0509	-0.2036	0.1125	0.1279	-0.2719	0.3163	-0.1529	-0.1111	-0.2544	1.0000				
V_{57}	-0.0634	0.0412	0.0435	-0.0383	-0.1447	0.0130	-0.0075	0.0245	-0.0598	0.0238	-0.0330	-0.1067	0.1432	0.2061	0.0758	0.0103	-0.0733	-0.0741	-0.0590	0.1159	1.0000			
V_{58}	0.0137	0.1416	-0.1005	0.0530	-0.0222	-0.1529	-0.0458	-0.0236	0.0730	0.0378	-0.0050	0.0184	0.1157	-0.0593	0.1295	-0.1792	0.0353	0.0211	0.1510	-0.0547	-0.1469	1.0000		
V_{55}	-0.0175	0.0914	-0.0836	0.0359	-0.0393	0.0171	-0.1528	-0.1018	-0.0750	-0.1250	0.1947	0.0310	0.1305	0.1265	-0.1399	0.0132	-0.0797	-0.0334	0.1614	-0.0402	-0.0493	0.0375	1.0000	
V_{68}	0.1034	0.0683	0.1148	0.0104	0.0522	0.2318	0.0931	-0.0327	0.0164	-0.0130	-0.0539	0.0856	0.1670	0.0696	-0.0605	0.0333	-0.0139	0.0459	-0.1124	0.1587	0.1139	-0.0643	-0.0485	1.0000

Key:

V_{73} : Age/Weight

V_3 : Age of the mother

V_7 : Earning per month (Salary)

V_8 : Number of people in the household

V_{11} : Earning per month: Income generating projects

V_{12} : Mother's level of education

V_{14} : Breast-feeding method

V_{15} : Commencement of breast-feeding

V_{16} : Frequency of breast-feeding during day time

V_{17} : Frequency of breast-feeding during night time

V_{19} : Age of the child when stoped breast-feeding.

V_{23} : Bottle-feeding

V_{28} : Weaning period

V_{32} : Feeding frequency of foods other than milk

V_{39} : Production of family food

V_{42} : Spend of money on food per month

V_{43} : Availability of food in terms of hectares cultivated

V_{44} : Availability of food in terms of bags harvested per hectare

V_{47} : Parity of the mother

V_{53} : The age of the mother when getting the first child

V_{57} : Infection/diseases: Admission of the sick child or normal treatment

V_{58} : Duration of admission for sick children

V_{59} : Immunization of the child

V_{68} : Birth weight.

APPENDIX F

Figure 4: Path Coefficients showing Direct and Indirect Effects of some Selected Factors Influencing Nutritional Status as Expressed in Weight-for-Age (Direct Effects are printed in bold Diagonally)

Factor	INDIRECT EFFECTS VIA																				Total Correlation with Nutritional Status
	V_1	V_7	V_9	V_{11}	V_{12}	V_{14}	V_{15}	V_{16}	V_{17}	V_{19}	V_{23}	V_{25}	V_{28}	V_{35}	V_{42}	V_{43}	V_{44}	V_{47}	V_{52}	V_{57}	V_{58}	V_{59}	V_{68}	V_{13}	
V_1	**0.0180**	0.0025	-0.0125	-0.0062	-0.0303	0.0032	-0.0022	0.0002	-0.0023	-0.0025	-0.0023	0.0035	-0.0048	0.0035	-0.0151	0.0148	-0.0014	-0.0026	-0.0142	-0.0015	0.0053	0.0066	0.0066	-0.0132	
V_7	0.0076	**0.0180**	-0.0003	0.0015	0.0152	-0.0152	-0.0092	-0.0026	0.0146	-0.0133	0.0050	0.0025	-0.0112	-0.0014	0.0026	0.0191	-0.0018	0.0016	-0.0481	-0.0017	-0.0041	-0.0060	0.0111	-0.0175	
V_9	0.5102	0.0002	**-0.0590**	-0.0078	-0.0139	-0.0107	-0.0033	-0.0095	0.0063	-0.0181	-0.0660	0.0054	0.0145	0.0026	-0.0032	0.0115	-0.0008	-0.0211	0.0934	0.0015	0.0024	0.0029	0.0010	-0.0761	
V_{11}	0.0001	-0.0003	-0.0040	**-0.1040**	0.0027	0.0015	0.0075	0.0007	0.0033	0.0401	0.0003	-0.0007	-0.0173	0.0002	0.0004	0.0257	-0.0027	-0.0010	-0.0031	0.0058	-0.0069	-0.0026	0.0060	-0.0743	
V_{12}	-0.0155	0.0029	0.0082	-0.0030	**0.0930**	-0.0092	0.0014	-0.0006	0.0072	-0.0035	0.0002	0.0042	-0.0313	-0.0074	0.0104	-0.0251	0.0001	0.0191	-0.0237	-0.0085	-0.0053	0.0012	0.0225	0.0637	
V_{14}	0.0011	-0.0019	0.0043	-0.0016	-0.0056	**0.1430**	0.0139	0.0053	-0.0716	0.1252	-0.0015	-0.0142	0.0353	0.0009	0.0059	0.0367	-0.0007	0.0030	-0.0032	0.0003	-0.0019	-0.0110	0.0090	0.2455**	
V_{15}	-0.0014	-0.0021	0.0026	-0.0132	0.0017	0.0263	**0.0770**	0.0043	-0.0358	0.0502	0.0136	-0.0054	-0.0051	-0.0054	0.0042	-0.0615	-0.0003	0.0001	0.0020	-0.0010	-0.0010	-0.0071	-0.0032	0.1355	
V_{16}	0.0012	-0.0053	0.0032	-0.0030	-0.0054	0.0861	0.0378	**0.0090**	-0.0867	0.1283	-0.0057	-0.0151	0.0408	-0.0043	0.0156	-0.0049	0.0016	0.0001	0.0113	0.0024	0.0032	-0.0054	0.0015	0.1522*	
V_{17}	0.0011	-0.0021	0.0025	0.0058	0.0054	0.0542	0.0245	0.0052	**-0.1258**	0.1062	-0.0024	-0.0114	0.0277	-0.0045	0.0823	-0.0062	0.0023	0.0045	0.0124	-0.0010	0.0026	-0.0052	-0.0018	0.1133	
V_{19}	0.0007	0.0015	-0.0062	0.0063	0.0019	-0.1102	-0.0406	-0.0065	0.0775	**-0.1710**	-0.0012	0.0152	-0.0383	0.0011	-0.0072	-0.0621	0.0000	-0.0042	0.0078	0.0001	-0.0002	0.0110	-0.0052	-0.2658**	
V_{23}	0.0019	-0.0016	-0.0061	0.0005	-0.0004	0.0047	-0.0130	0.0009	-0.0052	-0.0034	**-0.0580**	0.0044	0.0126	0.0037	0.0037	0.0056	-0.0002	-0.0053	0.0286	0.0043	0.0008	0.0022	0.0083	-0.0153	
V_{25}	0.0068	0.0008	-0.0054	0.0012	0.0067	-0.0353	-0.0122	-0.0023	0.0241	-0.0471	-0.0043	**0.0590**	-0.1124	0.0052	-0.0065	0.0064	0.0001	-0.0015	-0.0154	-0.0057	0.0047	0.0054	0.0162	-0.1135	
V_{28}	0.0010	0.0008	0.0035	-0.0074	0.0120	-0.0214	0.0015	-0.0015	0.0143	-0.0271	0.0030	0.0278	**-0.2420**	0.0037	-0.0138	0.0109	0.0001	0.0016	-0.0175	-0.0082	-0.0025	0.0051	0.0058	-0.3456**	
V_{35}	0.0055	-0.0003	-0.0021	-0.0003	-0.0093	0.0013	-0.0067	-0.0005	0.0077	-0.0025	-0.0029	0.0041	-0.0121	**0.0740**	-0.1616	0.0833	-0.0130	-0.0110	0.0373	-0.0030	0.0053	-0.0101	-0.0055	-0.0173	
V_{42}	-0.0043	0.0003	0.0010	-0.0002	0.0054	0.0048	0.0018	0.0008	-0.0086	0.0018	-0.0012	-0.0021	0.0165	-0.0664	**0.1800**	-0.0943	0.0126	0.0118	-0.0434	-0.0004	-0.0073	0.0010	0.0081	0.0243	
V_{43}	0.0055	0.0027	-0.0055	-0.0191	-0.0037	0.0008	-0.0008	-0.0003	0.0030	0.0028	-0.0025	0.0002	-0.0204	0.0507	-0.1315	**0.1290**	-0.0125	-0.0089	0.0209	0.0032	0.0014	-0.0057	-0.0018	0.0421	
V_{44}	0.0036	0.0017	-0.0023	-0.0147	-0.0003	0.0053	0.0011	-0.0007	0.0145	0.0001	-0.0005	-0.0004	0.0007	0.0505	-0.1152	0.0876	**-0.0190**	-0.0074	0.0193	0.0030	0.0009	-0.0024	0.0045	0.0263	
V_{47}	0.0107	-0.0006	-0.0244	-0.0020	-0.0049	-0.0086	-0.0001	-0.0030	0.0111	-0.0140	-0.0061	0.0018	0.0077	0.0159	-0.0417	0.0225	-0.0028	-0.0510	0.0362	0.0024	0.0078	0.0116	-0.0109	-0.0455	
V_{52}	0.0050	0.0063	0.0036	-0.0024	0.0151	0.0034	-0.0011	-0.0057	0.0113	0.0087	0.0121	0.0065	-0.0310	-0.0201	0.0570	-0.0157	0.0027	0.0135	-0.1370	-0.0046	-0.0027	-0.0025	0.0154	-0.0605	
V_{57}	0.0020	0.0008	0.0023	0.0150	0.0016	0.0011	0.0019	-0.0005	-0.0030	0.0005	0.0062	0.0084	-0.0459	0.0056	0.0019	-0.0102	0.0014	0.0030	-0.0159	-0.0400	-0.0056	-0.0036	0.0110	-0.0684	
V_{58}	0.0068	-0.0018	-0.0036	0.0023	-0.0142	-0.0069	-0.0018	0.0007	-0.0110	0.0010	-0.0011	0.0068	0.0145	0.0096	-0.0323	0.0045	-0.0004	-0.0087	0.0039	0.0058	0.0410	0.0005	-0.0062	0.0137	
V_{59}	0.0044	-0.0015	-0.0024	0.0041	0.0016	-0.0225	-0.0078	-0.0007	0.0160	0.0033	-0.0018	0.0077	-0.0306	-0.0104	0.0024	-0.0103	0.0005	-0.0082	0.0055	0.0020	0.0003	**0.0128**	-0.0047	-0.0175	
V_{68}	0.0033	0.0021	-0.0006	-0.0065	0.0215	0.0137	-0.0025	0.0091	0.0024	0.0092	-0.0050	0.0059	-0.0168	-0.0045	0.0150	-0.0024	-0.0009	0.0057	-0.0217	-0.0046	-0.0026	-0.0035	**0.0970**	0.1094	

* = Significant at P<0.010 ** = Significant at P<0.001 Calculated "P" Residual = 0.8849